NOVEMBER 1956

GAS

A CHILTON PUBLICATION

ENGINEERING • UTILIZATION • PIPELINES • MANAGEMENT

DISTRIBUTION COMPANY UNITIZES COMPRESSORS

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Plan ahead with *Robertshaw* Oventrol® gas oven control. Here is a sensitive, accurate control that's durably built for long years of trouble-free service. It combines 100% automatic shut-off valve, integral pilot feed, pilot adjusting screw, integral pilot filter, gas cock and thermostat.

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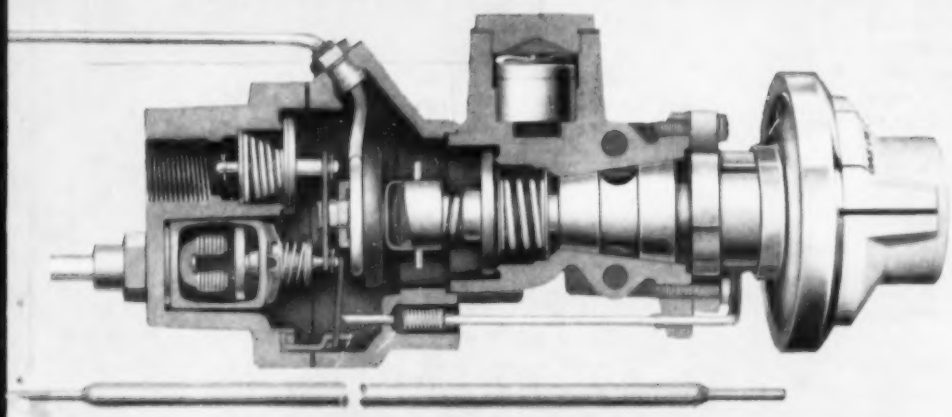

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OVENTROL combines the model BJ, field-tested by more than 20 million installations, with important improvements and modifications to meet the expanding service needs of the gas range industry.

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- Oven thermostat

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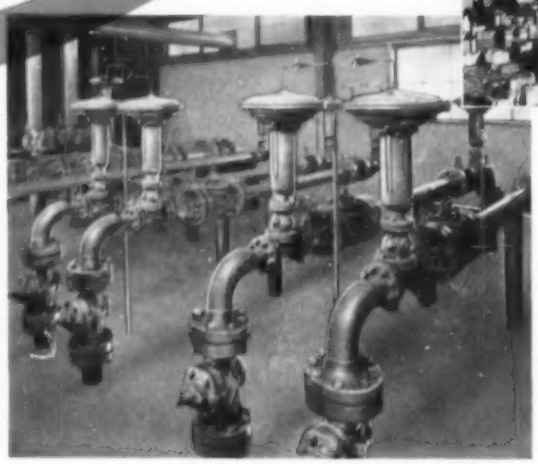

A battery of 2 inch large capacity type "P" streamflow *gas pressure reducing regulators, instrument controlled, on a large western distribution system.*

Single valve construction eliminates possibility of knocking and insures streamflow of fluids with minimum turbulence.

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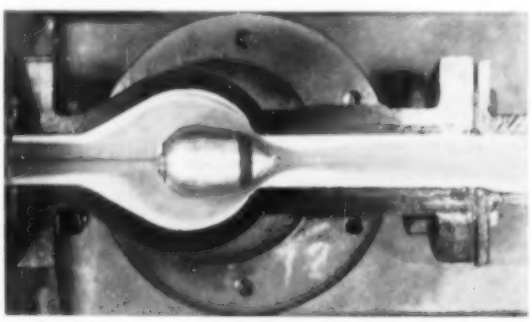
ALL RELIANCE REGULATORS are made from the best quality materials obtainable and their dependable performance has been proven by the operating results of thousands now in service.



Sectional view of streamflow *characteristics—valve in open position. Note curvature of fluid flow in* streamlined *movement and clear converging of stream discernable at outlet throat.*

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For complete data, request
Bulletin No. 42-C

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INCORPORATED (ESTABLISHED 1836)

RELIANCE REGULATOR DIVISION
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BPA

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those little Ridgid
drop-head dies I like-
Hank

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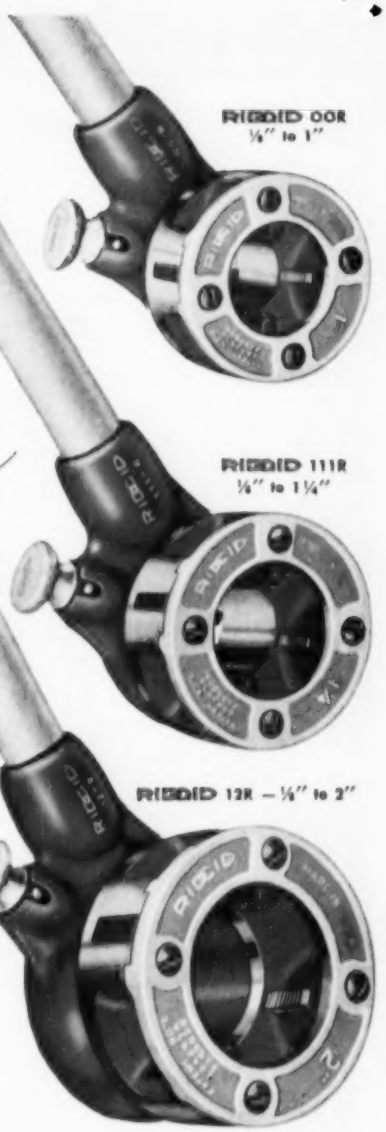

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This is Richmond,
the Capital City
of Virginia.

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This is Richmond
as the city looked
about 100 years ago.

MODERNIZED cast iron

A CENTURY ARE CUSTOMERS WHO KNOW FOR SURE!

RICHMOND, VA., installed cast iron gas mains 100 years ago... and still installs them.

The Richmond Gas Works (now a unit of the Department of Public Utilities) was completed in February 1851 and by March 1st streets were lighted and some of the "principal" stores, hotels and homes were using gas for illumination. On July 1, 1954 there were 532.28 miles of pipe in service of which 502.54 miles were cast iron.

The Richmond Gas Works has been buying cast iron pipe for more than a century. So have public utilities in more than sixty cities in the United States and Canada. Such customers, in any industry, are rare indeed. They must have a compelling reason. They do. They have proof — *sure knowledge* — of the long life, reliability and tax-saving economy of cast iron pipe.

Cast iron pipe has been a rugged, long-lived product from the earliest days. Today's *modernized* cast iron pipe, centrifugally cast, is even stronger, tougher, and more uniform in quality.

Cast Iron Pipe Research Association,
Thos. F. Wolfe, Managing Director,
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This cast iron main laid in Richmond in 1851 is still functioning after more than a century of service.

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The Q-Check stencilled on pipe is the Registered Service Mark of the Cast Iron Pipe Research Association.

pipe FOR MODERN GAS DISTRIBUTION

GAS Thermally Thinking

Specialization vs. "know-your-industry"

GAS producers, pipeliners, and distributors all sell gas. The basic end market point for this fuel is in the domestic appliances. Yet, how many domestic consumers ever see gas—the fuel—itself? None. The domestic consumer bases appraisal and acceptance of the gas industry on the appearance, performance, and economy of the gas appliances used. Much of the appliances' acceptance is, in turn, based on another relatively unseen factor, appliance control systems. It seems to me that every person who derives his basic income from the gas industry should know, and be conversant about, modern gas-fired appliances and their controls.

Producers and pipelines need the utility market to maintain current sales and increase them through the years. The utilities certainly must have the domestic market because it supplies a commanding majority of their revenue. Obviously, the domestic market is the backbone of the gas industry—including producing companies, transmission companies, straight distribution utilities and integrated companies. All of these segments should be interested in the end customers' acceptance of the gas industry. They should "know" a most important phase of the gas business—the appliances and controls phase.

It doesn't make any difference what a person's position or profession in the gas industry is, he is the first line of contact with the public that is needed to back up the initial appliance-control contact. Sales and acceptances of the gas appliance-control concept by the consuming public mean continued or increased gas sales; therefore, the concept should be important to producers, pipeliners, and distributors alike. But is it?

Pipeline and producing personnel we have talked with are pitifully short on gas appliance and control matters. There is a surprising amount of unfamiliarity on the subject in some distribution companies. If gas industry people throughout the fullest scope of the industry's operations do not have strong feelings about modern gas appliances and their safe, automatic control systems, who should have?

I think we have taken the trend to specialization too seriously. We need specialists in every phase of the gas business, but we shouldn't let specialization develop to the point where people ignore gas industry functions that do not specifically affect their particular working area or profession. Management continually seeks the technical and other specialist, but according to recent studies and surveys the most critical shortage today is the well-rounded individual management needs for promotion into executive administration positions.

There is a story that needs to be told in the modernity and economy of gas appliances, and the utility and safety provided by their control systems. The entire industry should do the telling. In the distribution companies, don't leave it all up to the sales and service personnel. In the pipeline and producing companies, don't leave it all up to the utilities. It is one industry with one objective—to sell gas. All segments of the industry have the responsibility to protect and augment the basic market that domestic gas-fired appliances constitute.

J. Fred Ebdon

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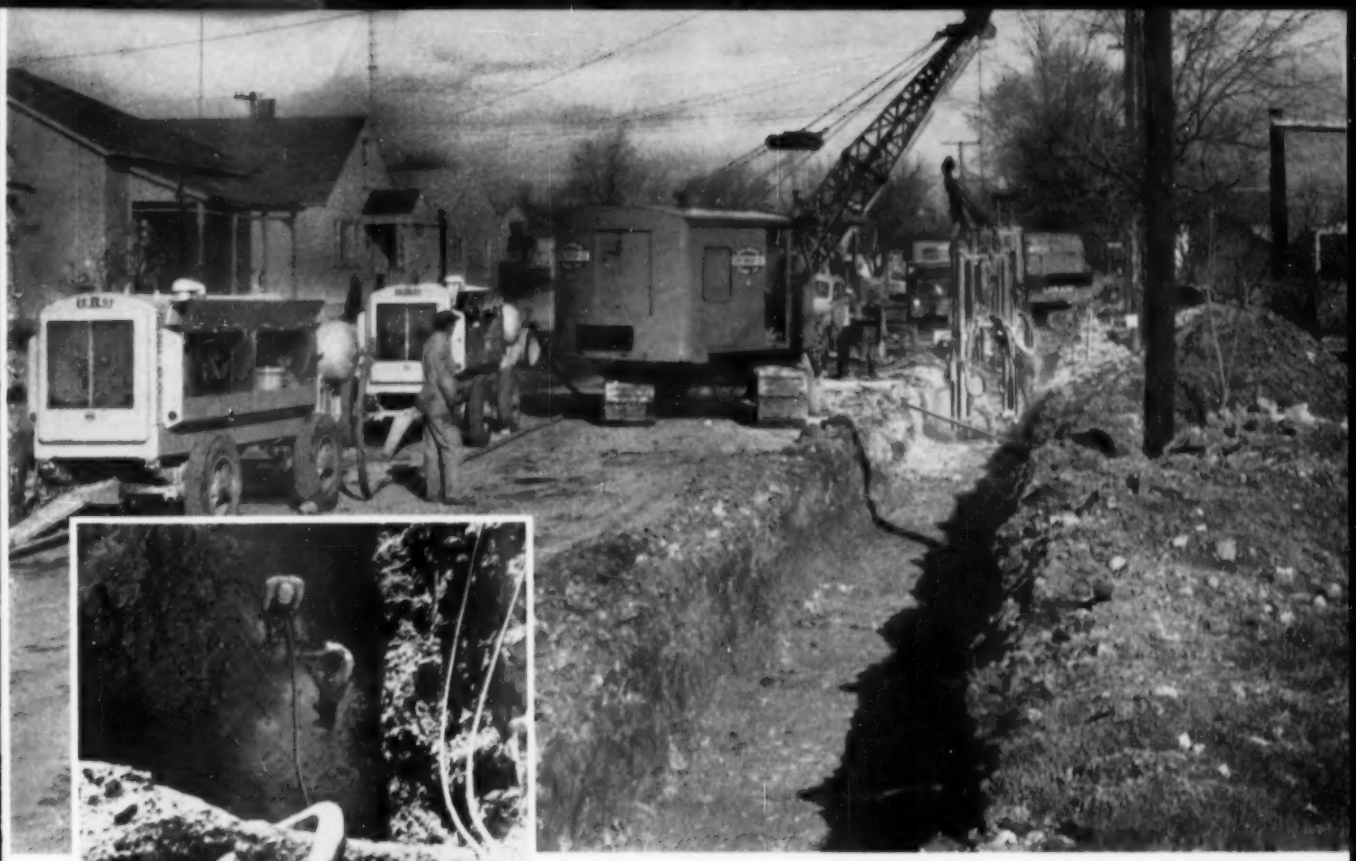

Typical trench depth on $1,000,000 sewer excavation job by Geo. Sheaf & Company. Le Roi air power and Le Roi-Cleveland air tools were used to drill through rock.

Le Roi-Cleveland PL30 Drill Rigs, hung from crane boom, cut production time in half on the rock drilling project by Geo. Sheaf & Company near Tiffin, Ohio. Le Roi 600-cfm portable air compressors, and a self-propelled, 125-cfm Le Roi Tractair provided air power.

Rock-Drill Rig on Sewer Job Speeds Production 50%

Contractor uses Le Roi-Cleveland Air Tools to shoot and pull rock, often 18 feet deep, with one drilling.

The right air tools made quite a difference on a $1,000,000 sewer excavation near Tiffin, Ohio. Joseph Parker, General Superintendent of Geo. Sheaf & Company, Columbus, Ohio, states, "In nearly seven months of service in hard limestone, our Le Roi compressors and Le Roi-Cleveland Rock Drills had no down time, while in continuous operation 8 to 16 hours per day. They have performed to our utmost satisfaction. By using Le Roi-Cleveland PL30 Drill Rigs, we lowered our drilling costs and speeded production by 50 per cent."

Flexibility of special drill rig was a major factor in job speed-up. The Le Roi-Cleveland PL30 Drill Rigs provided unusual flexibility and ease of operation. This specially-designed rig, developed for rock work on pipeline projects, allowed the contractor to obtain proper drilling patterns for safe blasting in residential areas. Thus he cut construction time in half because he could shoot and pull the rock with only one drilling.

The Contractor standardized on Le Roi-Cleveland Air Tools using two PL30 Drill Rigs, two Model 52 Breakers, and two H10B Sinker Drills, plus hose, drill steel, and rock drill bits.

Le Roi air power helped speed up this project. Two Le Roi 600-cfm portable air compressors, and one self-propelled Le Roi Tractair (a combination 42-hp. wheel tractor and 125-cfm air compressor) were used.

This combination of Le Roi air power and Le Roi-Cleveland air tools gave the contractor exceptional drilling economies, including manpower savings, less upkeep, and more footage per shift.

Le Roi Division of Westinghouse Air Brake Co., Milwaukee 1, Wisconsin, manufactures portable and stationary air compressors, heavy-duty industrial engines, the Tractair and air tools. Write today for information about any of these products.

RD-78

GAS highlights

SPOT NEWS, TRENDS, COMMENT ON GAS INDUSTRY AFFAIRS

NOVEMBER 1956

Office of Oil & Gas of the Interior Department is studying possibility of a successor to PAW (Petroleum Administration for War) in case war starts in the Middle East (odds are against this, now). The contemplated group would be called War Petroleum and Gas Agency.

The motion to dismiss the Midwestern-TGT-Iron Ranges applications, which seek certification to build a pipeline to serve markets in the Midwest and import-export natural gas from and to Canada, was denied by FPC's Presiding Examiner Hall. This gives both the Midwestern project and the under-construction Trans-Canada pipeline an indirect shot in the arm.

After spending $100,000 for promotion of a planned 431-home "All Electric Community" in Southern California, the builder has yet to sell all of the first 31 of the "all-electric kitchen" homes. Cryptic note: SoCal estimates an all-gas home in the same area would have the owner $2000 over a 10-year period.

When FPC hearings opened Oct. 2 on the proposed expansion of Colorado Interstate Gas Co.'s system to make deliveries to Natural Gas Pipeline Co. of America, for ultimate markets in the Chicago area, Colorado amended its application to provide for an increase of 110 MMcf/d to Natural Gas Pipe Line. This would bring total delivery to the latter company to 460 MMcf/d. Deliveries in the Rocky Mountain area would also be stepped up by 38 MMcf/d. The expansion, if approved by FPC, will add $87 million to the cost of the project.

Spokane (Wash.) Natural Gas Co. had just started well on its distribution system expansion—$6-million worth—when the city ordered the gas utility to suspend trenching operations so that roads can be put in shape for winter. Spokane Gas is getting initial deliveries of natural gas from Pacific Northwest's Scenic Inch. The 100,000 ft of mains planned for construction between now and the end of the year will have to wait for spring. Some customers will have to wait until then for natural gas service.

ALCOA has installed 24,000 ft of 8-in. aluminum pipe for 500 psig natural gas service at Port Lavaca, Texas. Pipe is laid bare, but experimental aluminum anodes have been installed.

Consumers' Gas Co. (Toronto, Canada) and Trans-Canada Pipe Lines have signed a contract for a 20-yr supply of natural gas to the distributing company. First year volume of 82.5 MMcf/d will be increased to 165 MMcf/d for the fifth year. Deal is estimated to produce a gross revenue for Trans-Canada of about $20 million. Should help their financing objective.

In spite of many predictions, control of natural gas producers has not emerged as a major point of issue in the campaign for the Presidency of the United States. The divided segments of the gas industry are, however, quietly working to heal the lacerations opened during the Harris bill battle.

A Landlords' Service Bureau has been formed by Brooklyn Union to aid apartment house owners in Brooklyn and Queens who must comply with Local Law 114 which requires cold-water-flat owners to install central heat and hot water systems within a specified time limit. BU is aggressively promoting central gas heating in cooperation with plumbing and heating contractors.

GAMA reports domestic gas-fired central heating units exhibited the expected seasonal gains as the heating season approached, but manufacturers reported shipments were down slightly from the immediate pre-heating season shipments for 1955.

Seattle, Wash., started getting long-awaited natural gas during turn-in ceremonies held Oct. 25 and 26. Scenic Inch pipeline is making the delivery to the Washington Natural Gas Co., for Seattle, Tacoma, etc.

The FPC, with Digby protesting, ruled that two owners of royalty interests—Northern Natural Producing Co. and Elk River Coal & Lumber Co.—should file for certification before selling gas to interstate pipelines for resale. Case has fanned up much comment as most gasmen feel FPC regulation of royalty owners would certainly defeat the trade and commerce in royalty interests.

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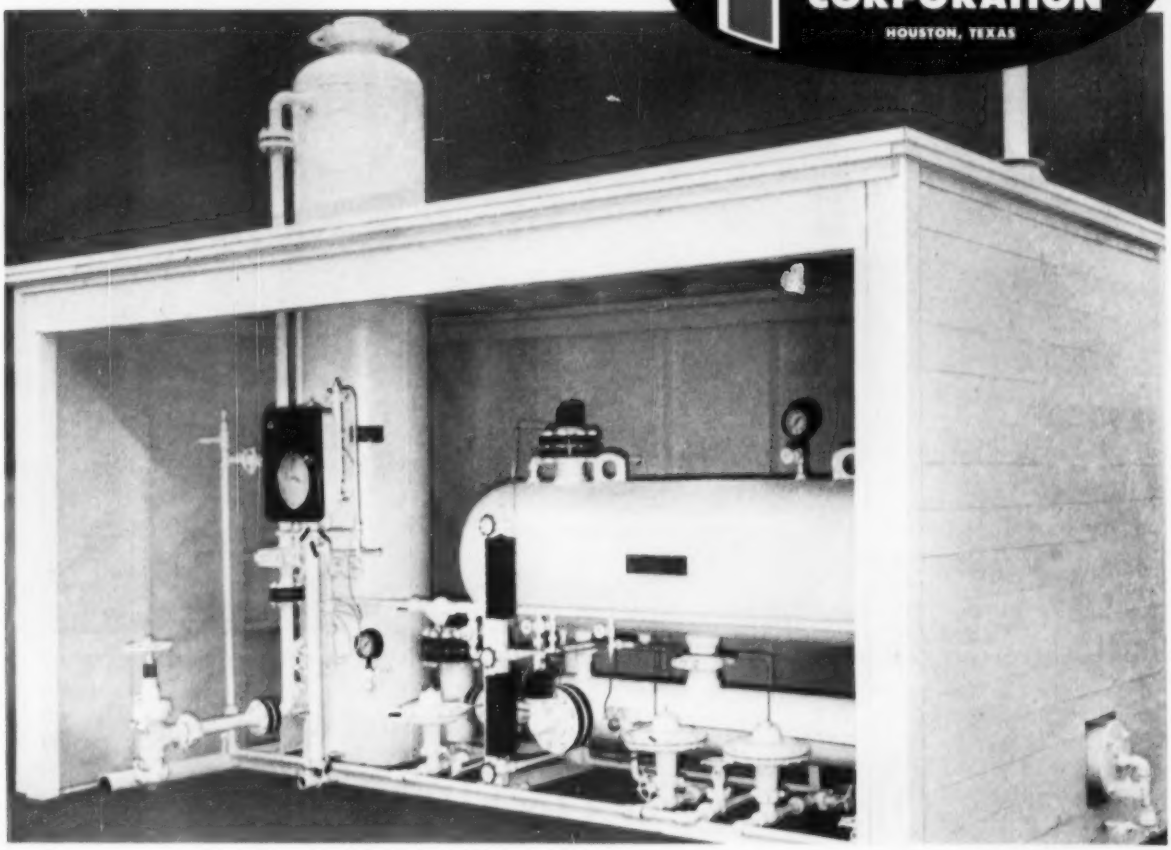

the new FISH well head gas dehydration unit

Here is a revolutionary new gas dehydration unit that greatly reduces overall dehydration costs. The new Fish Unit uses calcium chloride as the dehydration agent in a tower of patented design that removes from two to three times as much water per unit of desiccant as former methods. No fuel is needed for the dehydration tower. No maintenance is required aside from reloading desiccant and changing charts.

The Fish Dehydration Unit is packaged to include a separator, a heater to keep water in the separator above freezing and necessary controls and instruments. The entire unit is enclosed in a winterized structure.

Extensive field tests have proved the efficiency of the Fish Dehydration Unit even in severe winter climates. For full information, write Fish Engineering Corporation, Manufacturing Division, Aztec, New Mexico.

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DOW

Many utility regulators favor "balanced" rates

IT will be encouraging to the owners and managers of the $16 billion gas industry to learn about the enlightened attitude of many who regulate utility rates. It is well known that the United States Supreme Court considers utility rate-making to be a balancing of the interests of the consumers and investors. The Court permits pragmatic adjustments, and the use of various methods as long as the resulting rates are reasonable to both the owners and ratepayers. Of course, the exercise of expertise and judgment by the regulatory commissions takes place within a zone of reasonableness, so the attitude of those who prescribe utility rates becomes important. There is a significant difference in the compensation a utility is allowed to earn at the top of the zone of reasonableness compared with the bottom.

A distinguished member of the Virginia commission spoke recently at a convention of the National Association of Railroad and Utilities Commissioners. Commissioner H. Lester Hooker criticized the myopic regulatory attitude which forces subsistence rates on utilities. This regulator asserted:

"One of our responsibilities, it seems to me, is to realize fully that regulation must have a long-range view. We do a partial job, and a poor job, if we think that regulation begins and ends with hammering down the rates which a utility can charge. All of us are familiar with the American fable which concerns the farmer who sought to save corn and hay by feeding his horse less and less, until the horse died. Well, if we want a utility to keep on working, we must supply enough 'feed.' Only a healthy utility can develop new services and get the capital to introduce the better service that the public interest requires.

"The commission that fails to see that the utility continuously receives a reasonable and fair return is not, in my opinion, properly protecting the consumers in the long run. The money that the impoverished company is compelled to borrow from time to time is secured (if obtainable) at a much higher cost than in the case of the company that has shown a consistently fair return over the years and is giving satisfactory service to the public it serves. These things cannot be accomplished when a regulatory commission only allows the utility a miserly return on its investment.

"A second responsibility which we should accept is that ours is the task of blending the position of consumer and utility. Actually, the interests are identical but it's easy to forget this when we see one side drawn up against the other. Were we in utopia, our role would be easy. In utopia, the consumer would recognize the long-range benefit in the utility being healthy and strong. The utility would have no thought other than the lowest rate possible, consistent with good management. But this isn't utopia. And, since it isn't, ours is the responsibility of developing and maintaining the broad-gauge realization that the consumer interest is best served by having the utilities healthy and strong so that they can serve tomorrow's needs, as well as today's.

"I think it is possible that someone is thinking that I can see only sweetness and light, that I favor 'easy regulation.'

"In closing, I'd like to speak forcefully on this point. What I suggest is far from 'easy regulation.' In fact, I think that taking a short-range view, cutting rates on existing services, perhaps is the easiest of 'easy regulation.' It's pretty simple and, unhappily, it's adverse to the best interest of the consumer.

"What I do suggest is much more difficult, a tiresome and often bewildering assignment. It's the chore of keeping today's costs as low as they can and at the same time making sure that tomorrow we'll have the amount and kind of services we want."

The function of a regulatory commission was aptly described by Chairman Kuykendall of the Federal Power Commission:

"There seems to be an impression among many people that the Federal Power Commission is a price-fixing agency whose purpose is to maintain a ceiling on the price of natural gas sold for resale in interstate commerce and thus act in a capacity similar to that of the Office of Price Administration which existed during World War II. Such a conception is not accurate.

"While it is true that we have a duty to prevent natural gas companies from making excessive profits, it is just as true that we also have a duty to see that such companies are permitted to make a reasonable profit.

"The FPC has no authority to compel a utility under its control to absorb the additional expenses brought about by inflation and to render the customer of the utility immune from them. On the contrary, the law requires us to fix

*A monthly commentary on national and state developments by an expert in the field of utility law.

rates that will yield a fair return after all expenses have been met.

"This reasonable profit is frequently referred to and computed as a fair rate of return on the total net investment in property which is used and useful in the rendition of service by the utility. While the decisions of virtually all rate-making commissions, both state and federal, are subject to review by the courts, the courts do not and cannot become rate-making agencies themselves. Hence the courts do not ordinarily reverse or modify rate decisions of regulatory agencies unless it is found that they are wholly unreasonable, confiscatory, discriminatory, or violate some particular statute or constitutional provision. Thus a regulatory commission has a wide area of discretion in which it may operate without interference or correction by the courts. Therefore, it is extremely important that the regulatory agency act in a fair and impartial manner at the outset.

"Since the earnings of utilities, including natural gas companies, are limited, such concerns do not have an opportunity to build up large surpluses as do some other concerns in freely competitive businesses. This means that a natural gas company which desires to expand can do so only if it can attract new capital. Its record of earnings and its prospects for the future must be such that investors are willing to lend their money to, or buy stock in the utility, in expectation of receiving adequate interest or dividends by so doing. Therefore, it is to the benefit of the consuming public as well as to the utility and its creditors and shareholders that the utility have adequate earnings. Otherwise, there will be no appreciable expansion of service. Likewise, inadequate earnings, long continued, will result in the impairment of present service.

"Many members of the public do not seem to realize fully that the investment bankers who purchase the securities of natural gas companies and other utilities are purchasing for the account of, or are buying and reselling the securities to insurance companies, investment trusts, and similar institutions. These institutional buyers are, in turn, using the money supplied by many thousands of their policyholders or shareholders. Consequently, thousands and perhaps millions of people throughout our country have a real and substantial interest in the financial success of the various natural gas companies, even though they themselves are not aware of that fact.

"Investors, bankers, and other specialists in public utilities study the various utilities to evaluate their financial abilities and prospects. Since the amount or rate of earnings of the utility is decided, not by the management of the utility, but by the governmental agency which regulates it, and may be changed from time to time by circumstances beyond the control of the utility, the general attitude of the regulating agency becomes an important factor in evaluating utility securities. The phrase 'regulatory atmosphere' is frequently used to describe this factor in appraisal of public utility securities.

"A regulatory commission has an obligation to endeavor to maintain a regulatory atmosphere which will give the investor enough confidence to let his money be used in enterprises which are regulated by that commission."

FPC Chairman Kuykendall knows that incentives help increase the efficiency of management. He made this hopeful comment:

"In regulated industry the desire for increased profits provides the incentive for increased efficiency which will lower costs. There, efficiency produces its own reward. Unfortunately, it is no simple matter for a regulatory commission to recognize, appraise and reward a utility for its efficiency. Generally, any savings which have been made by a utility through unusual efficiency are given to the customers of that utility by adjusting the rates in the first rate case which occurs after the economies have been effected. This procedure seems to protect the public interest without depriving the utility of a fair rate of return. Yet, the knowledge on the part of a utility that any savings produced by additional effort and efficiency will promptly be taken away from it, may discourage or prevent it from making such savings. Thus, in the end, the public may have to pay higher rates than it would have paid if the utility had received greater encouragement to be efficient. This problem deserves further study."

The NARUC committee on corporate finance agreed on this enlightened approach toward keeping utilities financially strong:

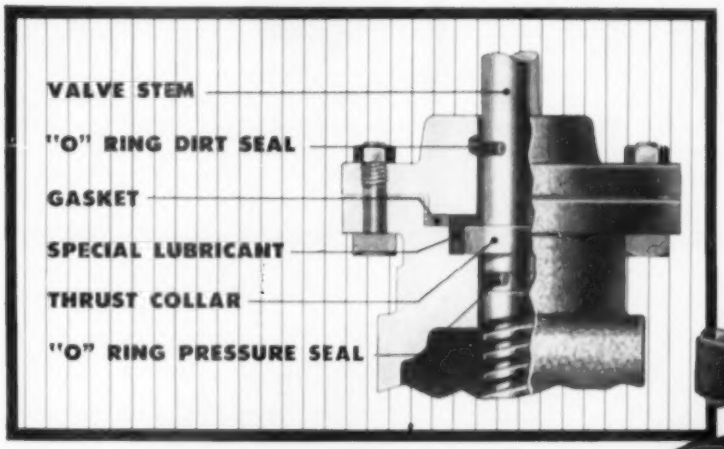
"Good credit, if once lost by a corporation, is seldom regained. At best, loss of prime credit standing results in increases in total capital costs. At worst, it will impair the quality of service and lead to a public reaction much more serious than any reaction against rate increases of the magnitude required to restore the utilities' financial position to the same level as in 1940.

"Today, as in the 'twenties, a critical appraisal of utility financing practices is called for to insure the financial soundness of these essential institutions in future years. Since the last war there has oeen a greater spread between the earnings of utilities and industry generally than existed previously and if this spread is to be continued through holding rates down to bare subsistence levels it is highly questionable if the public interest will be served in the long run.

"Similarly a wide gap has developed between general price, wage and income levels and the level of utility rates. The commissions have been industrious in keeping rate increases to modest proportions—perhaps too much so—as is evidenced by many repeats in applications. What might have to be done ratewise in order that the utilities will continue to be able to obtain the new capital needed on reasonable terms will still be far below the increase in general prices. The assurance of the ability to raise capital is vital to public interest."

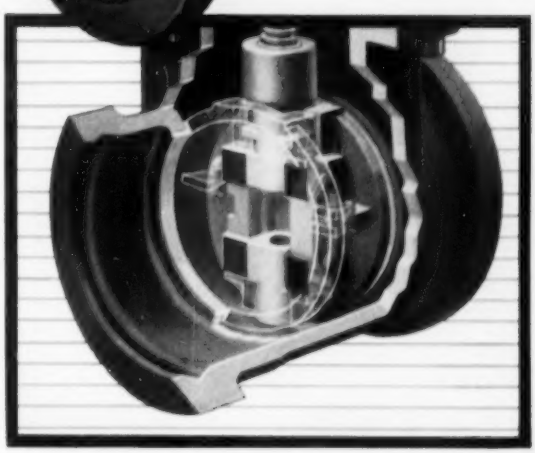
MUELLER

GATE VALVES for *positive* shut-offs!



Leak-proof stem seals. "O" ring seal below thrust collar seals line pressure—seats tighter as pressure increases. Top "O" ring seals out dirt and retains lubricant around thrust collar—assures lifetime easy turning without maintenance.

Perimeter pressure seating. Discs make lateral contact with seats. No sliding contact to reduce seat life. Four point disc wedging mechanism exerts closing pressure equally to four separate points near the outer edge of each disc. Prevents disc deflection and possible leakage.



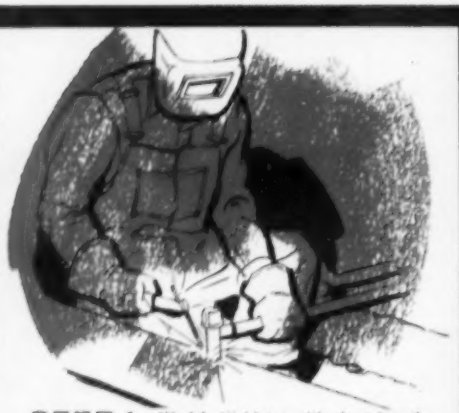
Convert all Mueller non-rising stem gate valves 12" and under to "O" ring stem packing. Contact your Mueller Representative or write direct.

MUELLER CO.

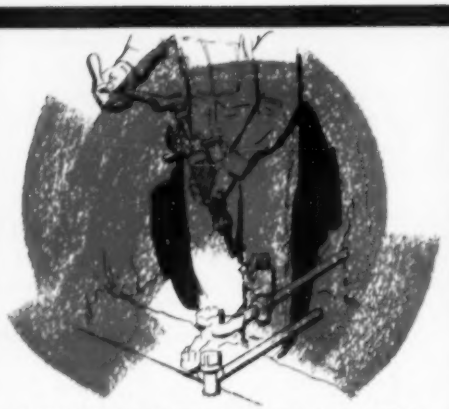
Dependable Since 1857

MAIN OFFICE & FACTORY DECATUR, ILLINOIS

NO-BLO®



STEP 1: Weld. Weld tee with short length of service pipe to new main. Weld line stopper fitting to old service line and attach control chamber to line stopper fitting.



STEP 2: Stop-off. Attach drilling machine to control chamber and drill through old service line. Remove machine, attach stopper, replace machine and make stop-off. Cut old service line and cap end. Install completion plug, remove equipment and cap fitting.

STEP 3: Transfer. Weld old service line to short section of line on new main. Mount control chamber and drilling machine to tee. Drill through new main. Close valve and remove machine.

Minimize customer inconvenience *transfer services* under pressure.

Increased gas pressures have required many communities to transfer services from old to new gas mains that will withstand higher pressures. The Mueller No-Blo® Method allows you to complete this operation safely, without loss of gas and with a minimum of customer inconvenience.

Mueller Service Tees or Service Valve Tees are installed on the new main under pressure with the "E-4" or "D-4" Drilling Machines. Services are stopped off and transferred from the old to the new main individually, without affecting other services on the main. Line stopper fittings may be salvaged for future use after old main is abandoned.

MUELLER NO-BLO® Method

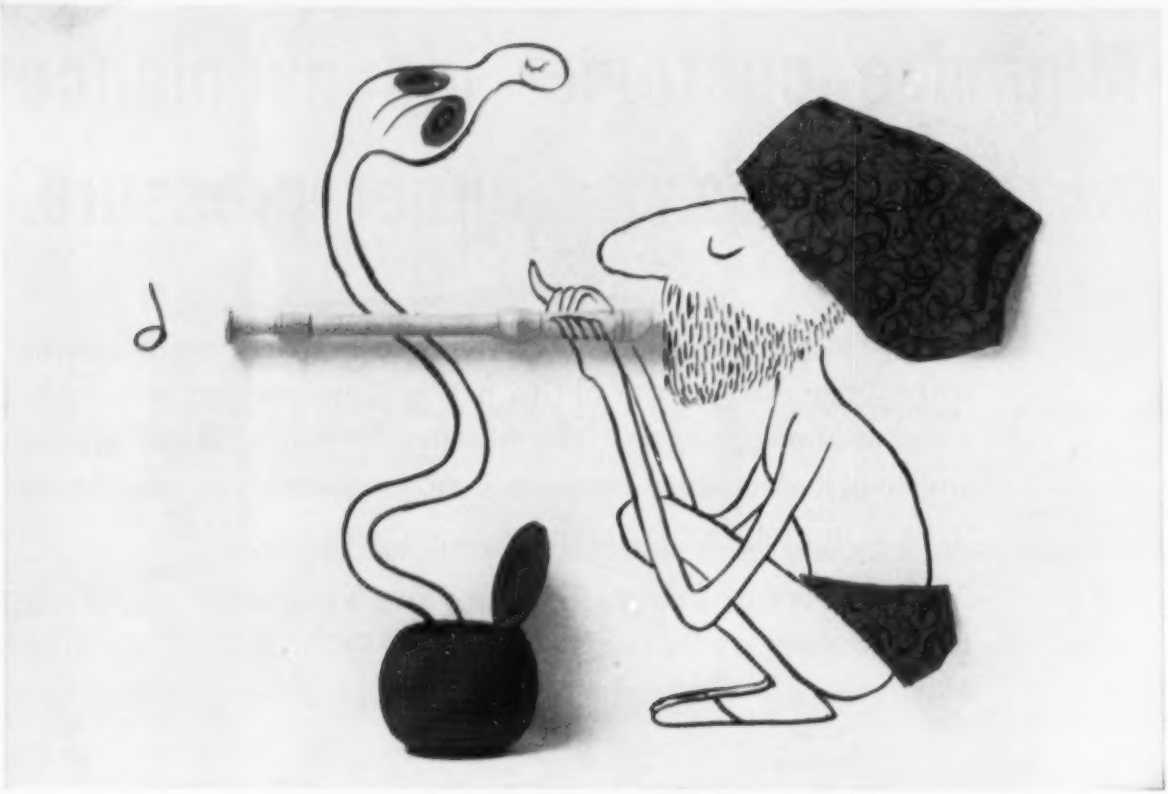
STEP 4: Complete. Attach completion plug or valve to drilling machine, remount and insert into tee. Remove equipment, tighten plug or valve and attach completion cap. Transfer has been made without loss of gas and without interruption to other services.

Write for the free No-Blo® Method booklet, "Safe Operating Practice". It shows how other gas installations are made in a safe manner without escape of gas.

MUELLER CO.

Dependable Since 1857

MAIN OFFICE & FACTORY DECATUR, ILLINOIS



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best gas odorant — best odorant service

Alert "80"

Your best economy-priced, quality mercaptan. Alert "80" gives better, full-range volatility and stronger initial "punch"—proved in all types of distribution systems by both large and small utilities. Alert "80" is a selected and blended group of mercaptans proved over the years to be *best* for natural gas odorization.

Calodorant "C"

Your best quality sulfide type

The only gas odorant in use that completely volatilizes under the most extreme high-pressure or low temperature operating conditions. Calodorant "C" is equally effective at medium and low pressures.

Specialists in odorization problems!

Since marketing the first gas odorant in 1927, Oronite's continuous research program has answered many a critical gas odorization problem. Being a leader in the field, chances are our experience can answer any problem you may have.

Oronite Odorometer

At last—a simple way to test odor intensities in distribution systems. Ask for a demonstration of the Odorometer — just contact any Oronite office.

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BIG CAPACITY— *LITTLE* BULK AND WEIGHT

Cast aside the idea that you need a bulky, heavy meter to handle 415 cfh loads. Cast your eyes on the Rockwell "415". It's housed in a trim, sturdy aluminum alloy case. The entire unit weighs only 19½ lb. One man can easily hold it aloft to install. The bowl type body with single joint construction minimizes leakage risks. To simplify service there's the quickly removable and interchangeable valve plate assembly. For a new appreciation of measurement at its finest, see . . .

The Rockwell "415"

- **FOR APARTMENT HOUSES**
- **SMALL INDUSTRIALS**
- **SCHOOLS, SHOPS, ETC.**

ROCKWELL *Aluminum* METERS

ROCKWELL "015" Regulators

BRING

Precise Control

WITH

Complete Safety

Pilot loaded Rockwell high pressure regulators with auxiliary spring control.

Operator adjusts pilot loading pressure on Rockwell "015" regulator fitted with auxiliary lever and weight control.

DUAL CONTROL SYSTEMS *DO THE TRICK!*

Rockwell *power pilot* regulators are available with two types of built-in auxiliary controls—spring, and lever and weight. In either case the auxiliary system is non-operative when the pilot loader is functioning normally. It takes over automatically should the inlet pressure fall below the setting of the pilot control. For complete safety, the auxiliary system serves to take over the regulating job should the pilot loader become inoperative. Write for bulletin 1086.

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YOU CAN RELY ON ROCKWELL

There's a ROCKWELL METER and REGULATOR for every use

METERS

REGULATORS

WASHINGTON

Industry leaders still seek compromise legislation

By NEAL REGEIMBAL

GAS Washington Bureau

LEADERS of the three segments of the natural gas industry are boring in to try to work out compromise legislation acceptable to all as a substitute to the vetoed Harris-Fullright bill. It's proving a tough, back-breaking job.

Despite reports of slightly milder weather when the three interests meet to discuss efforts to free independent natural gas producers from federal control, it is evident that the freezes created during the bitter campaigning in the last two years won't melt quickly.

Quips are tossed out timidly by one group—producer, pipeline, or distributor — and received lukewarmly by what was less than a year ago a bitter enemy. It wouldn't take much to bring the three segments of the industry back to the gun-toting, ready-to-draw warfare condition of the past.

This being the "get together" year for the industry, however, there are serious efforts underway to dull, and eventually kill all the ill-feeling, and bring new legislation to Congress for passage in 1957. After months of tentative meetings—small groups, feelers in speeches, and "mediators" collecting views—the industry in September put the problem on the table and started to work.

Occasion for the tete-a-tete was the annual meeting of the Independent Natural Gas Association of America at San Antonio Sept. 10 and 11.

In this newest attempt to iron out ruffled feathers and work toward new legislation, there is little discussion of any measure to completely free the producers. Instead, the push appears to be towards limiting control. The producers, talking informally at the INGAA meeting, seem to have agreed that distributors were not against the producer-created Harris bill, but they wanted to make sure certain protections were included.

Now, the drillers and sellers of gas are going to try to work out mutually acceptable legislation. Distributors, faced with increasing loads, are convinced that they have to make sure the producers are reasonably happy in order to insure their supply, but they want prohibitions against favored-nation clauses.

The only concrete suggestion made at the San Antonio meeting was from a pipeline official who suggested that producers with "unfavorable" escalation clauses remain under FPC control until they draft new contracts, and that new producers have their original contracts approved, and then not be subject further to the commission as long as those contracts are in effect.

The import of this meeting, and the efforts of the industry to get together, are not going unnoticed in Washington. Spokemen for the various interested associations in the nation's capital say that after elections—if all goes well in the industry—they hope to form small groups to take the suggestions put forth, draft some possible legislation, and then send it to interested parties for comment. In this way, they hope to come up with a bill they can put before Congress—and the White House—as being the combined request of the gas industry.

The Federal Power Commission may be the final intermediary in bringing the industry together on a bill. There has already been informal efforts to bring FPC in as a referee. Industry spokemen fear that unless they come up with some legislation—and the FPC is at least aware of what it is and how it would work—the commission will go before Congress next year and ask for legislative standards for administering existing regulations.

If a good bill is brought out of the industry, most observers believe there is a good chance it will pass.

In view of the heat the Harris bill created, and the lingering ill will it created, it is obvious that the industry can't go back before Congress split again next year. Another disruption like last year's, and the industry would be "eating public relations crow for a good many years," one gas industry leader caustically comments.

Senate probes misuses of mineral lease laws

A Senate Interior subcommittee, headed by Sen. Clinton P. Anderson (D - N. Mex.) is on the warpath over alleged abuses in the operation of the federal mineral leasing laws.

Senator Anderson's war party has been holding hearings on allegations that some gas and oil companies have been attempting to circumvent provisions of the laws, which restrict companies to leases totaling 100,000 acres of public lands at any one time. There are indications, he says, that some companies have been attempting to raid the public domain by setting up dummies or fronts to get around the acreage restriction.

His initial hearings were held at Albuquerque. Four firms—El Paso Natural Gas Co., Stanolind, Amerada, Phillips and Shell—were invited to the pow-wow.

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CAPTAN—20% more odor value every minute of the day. Every drum shipped is individually tested in our own laboratory. Uniformity, dryness, and cleanness are assured.

Your distribution system is uniformly odorized from the point of introduction to the end of your line.

You cannot beat this odorant which has been proved by laboratory, field and independent research tests.

BP CAPTAN—An odorant designed for a specific need. All distribution systems have their problems. BP CAPTAN has been blended and tested to meet your problem spots. The same safeguards are used here as on CAPTAN.

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TECHNICIANS—Where else can you find a Company with technically trained engineers who have 80 years combined experience?

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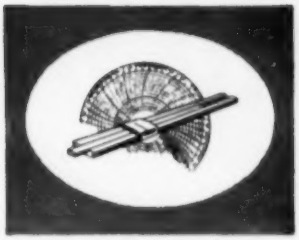
technical trends



By GUY CORFIELD

Thermal recovery of oil

For many years thought has been given to recovery of residual and low gravity oil (which has resisted primary production and secondary recovery and may represent as much as 80 per cent of the original deposit) by what might be termed "heat drive." By this is meant the application of heat underground to make the oil more fluid and develop pressure that will force it toward production wells from which it can be pumped in the normal way.

In its present state of development the process involves pumping air down an injection well and setting the oil on fire at the bottom. Continued combustion, and maintenance of the desired temperature which is thought to be 700-900°F., and rate of movement of the heat front, are controlled by rate of air injection.

It has been foreseen that such a procedure may involve many factors and problems such as overall effect of the combustion products, cracking of the oil from the high heat, formation of persistent oil-water emulsions, etc., which together with the cost of air injection may make the process uneconomic. Two tests have recently been started in California, which are planned to extend for several years and provide some reliable information.

A "particle bank"

A unique facility has been started by Stanford Research Institute of Menlo Park, Calif., which they term a "particle bank." As stated in SRI's announcement, it will consist of an extensive collection of selected powder samples with known characteristics such as particle size distribution and total surface. Samples of the powders on deposit will be available to universities, industrial and governmental laboratories for research uses.

Heretofore, there has been no organized source of such samples, thus necessitating costly and time-consuming preparation by laboratory personnel. Upon completion of research projects, the residues of the samples frequently are shelved, rarely being required again by the laboratory researchers. SRI has established the bank on the premise that if such a central depository were created, the residue powders could be made available to other research groups for specific projects. To supplement the powders already on hand, the bank is in the process of obtaining samples from known sources. Some of these are: bacteriological powders, cement, coffee-roast soot, pigments, crushed ores, talc, fluorspar, and corn smuts.

As part of the service, the bank informs inquirers of availability elsewhere if specified materials are not in stock. No checking of the reliability of sample data is conducted by the staff although analyses are undertaken as specific projects. A $5 handling charge is assessed per sample, which may range in weight from a milligram to several pounds. The bank was formed as a public service following a survey which indicated its desirability.

This "particle bank" would seem to be of interest to the gas industry. There is need, for instance, for a "standard dust" for checking the effectiveness of dust filters to protect pilot lights from outage due to plugging of tiny orifices. Dust with known characteristics might also be useful in instrumentation, testing and design of dust scrubbers for gas transmission lines.

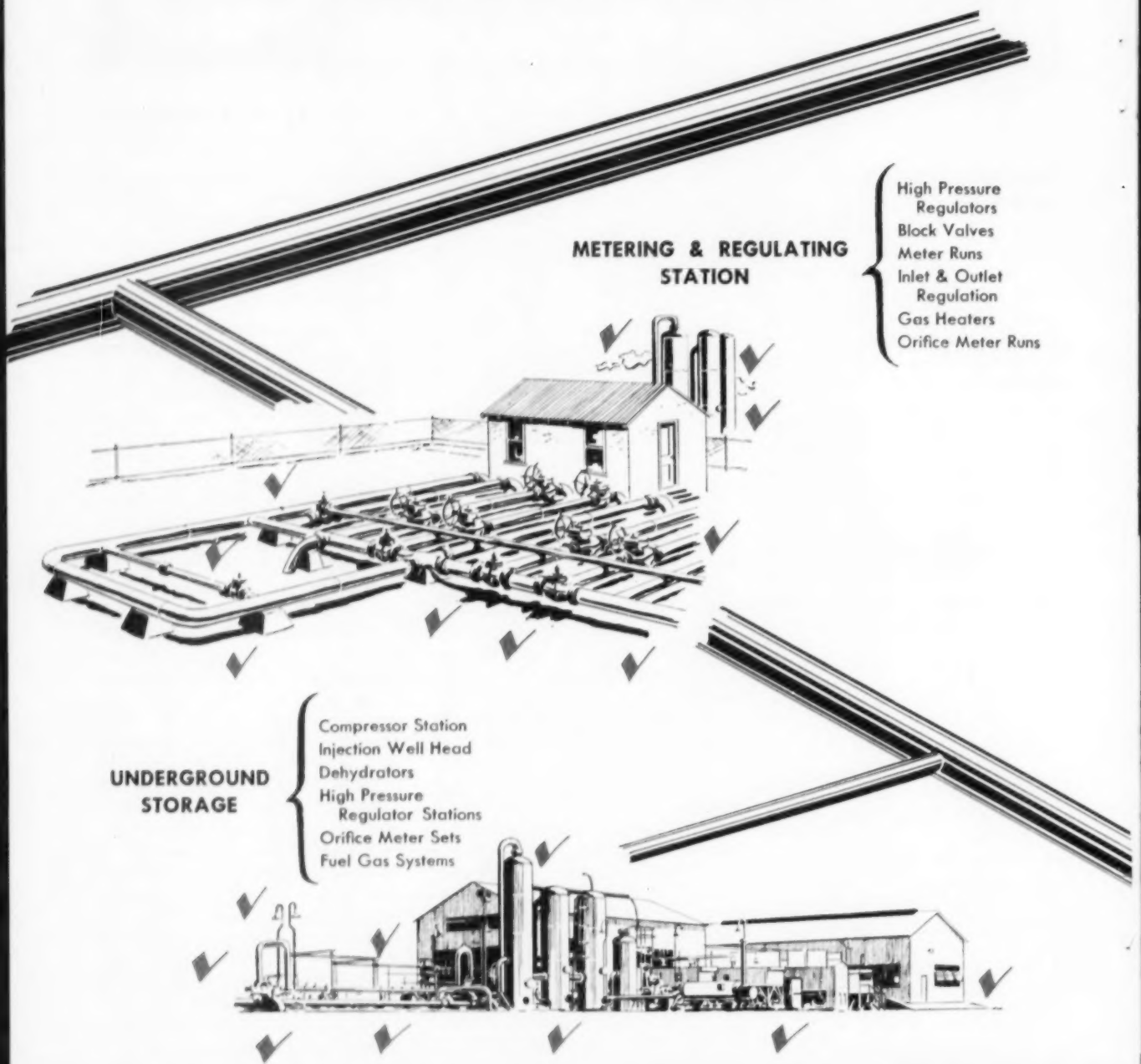
Higher and higher temperatures

Until a comparatively few years ago the hottest known flame was that of the oxy-acetylene torch, 5860°F. A natural gas-air flame reaches 3500°F., a carbon monoxide-air flame 3810°F., a hydrogen-oxygen flame 4815°F. and the German V-2 rocket (alcohol-water-liquid oxygen) 4940°F. The electric arc, and a focus of the sun's rays, also produce temperatures of the order of the highest so far listed, but can be applied usefully to only very small areas.

Work done recently at Temple University in Philadelphia has extended the man-produced heat range to approach that of the surface of the sun, 11,000°F. Powdered aluminum burning in oxygen has attained a temperature of 6400°F., and an oxy-aluminum torch is being developed commercially; this torch will cut concrete and refractory materials. A beryllium-oxygen flame has been measured at 7300°F. This same temperature is reached by a hydrogen-fluorine flame, and it is interesting to note that this mixture has the highest known burning velocity, reaching 2200 cms. per sec. which is about 100 times faster than a fuel gas-air mixture.

Going still higher, a cyanogen-oxygen mixture has developed an 8200°F. flame and, at the presently attained peak, a carbon subnitride-oxygen flame has reached 9100°F. By the use of pressure, and ozone instead of oxygen, still higher temperatures are considered attainable.

HUNDREDS OF PLACES



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- High Pressure Regulators
- Block Valves
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- Gas Heaters
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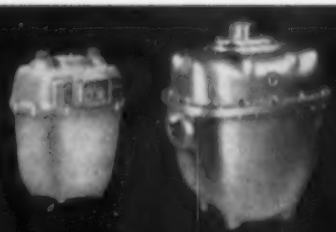
UNDERGROUND STORAGE

- Compressor Station
- Injection Well Head
- Dehydrators
- High Pressure Regulator Stations
- Orifice Meter Sets
- Fuel Gas Systems



Aluminum Meters in 4 domestic sizes

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TO SAVE MONEY

...and get safer, more dependable service with Rockwell Gas Products

Shown here are comparatively few of hundreds of key spots in gas transmission and distribution where it pays to use Rockwell gas products. Rockwell meters, regulators, instruments and Rockwell-Nordstrom lubricated plug valves are the world's most complete line of gas measurement and control products for your every need. They are the result of almost half a century of manufacturing know-how, design leadership and field proving. This means better flow control, safer operation and—always—lower cost.

For complete information on Rockwell products for gas distribution, write: Rockwell Manufacturing Company, Pittsburgh 8, Pa. *Canadian Valve Licensee:* Peacock Brothers Limited

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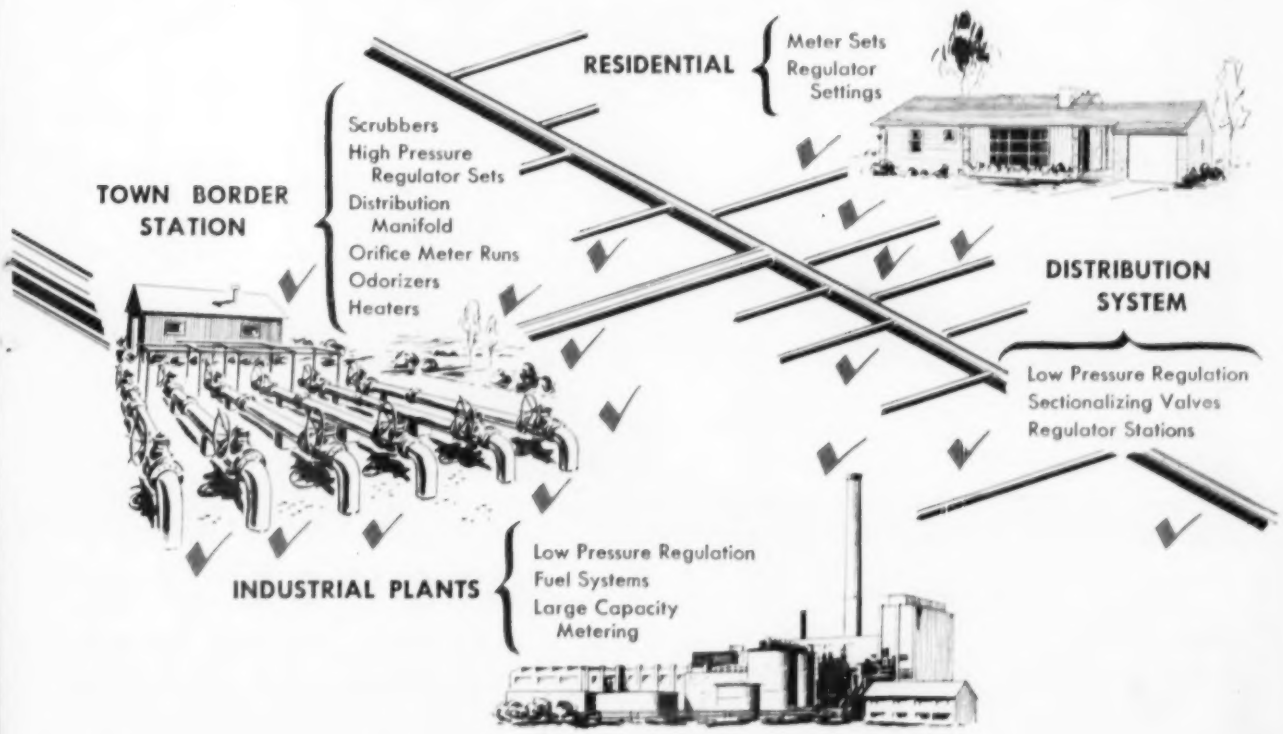
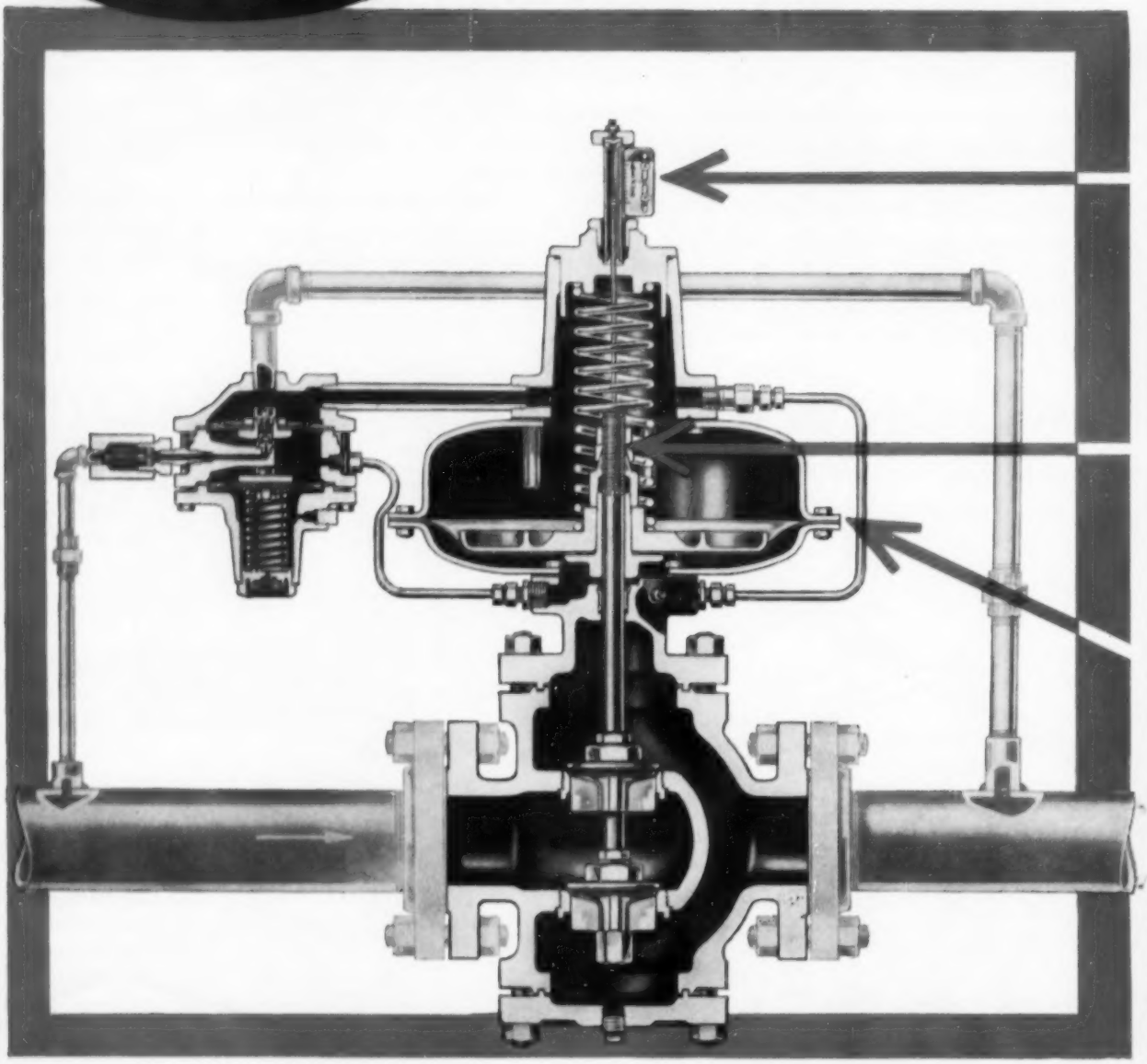
Lubricant Sealed For Positive Shut-Off

40th YEAR *of lubricated plug valve leadership*



something NEW

FISHER® type 298T



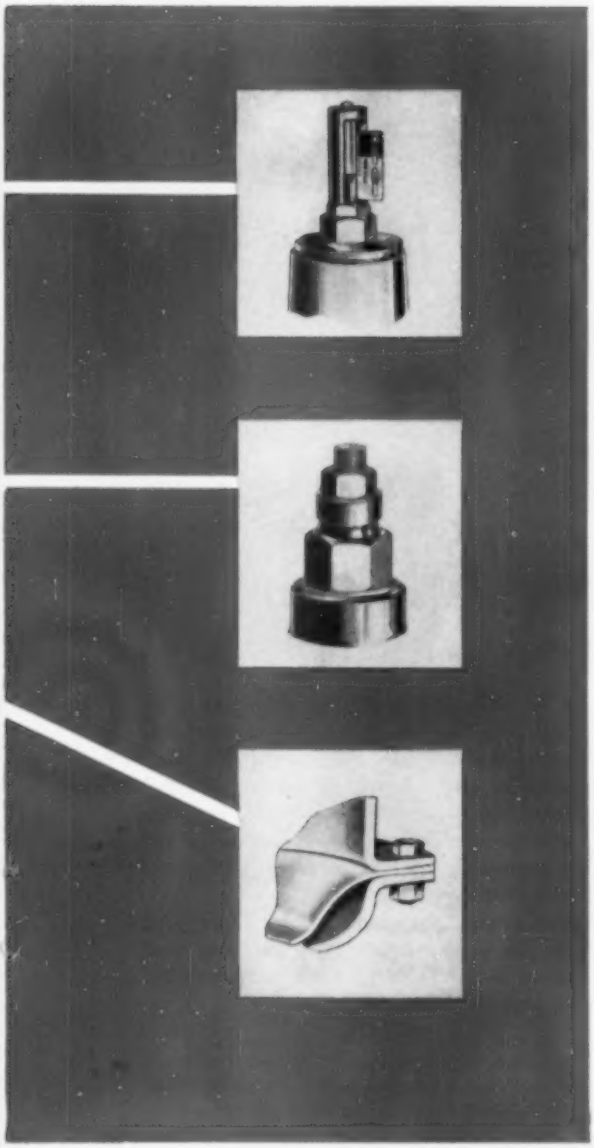
FISHER

MARSHALLTOWN, IOWA

LEADS THE INDUSTRY IN

has been added!!!

gas regulator



The Fisher Type 298 which for so many years has been *the* gas regulator for district and industrial gas regulator service, now has these important improvements—

Now—A travel indicator* that shows valve position at all times, yet no stuffing box or friction causing seal is required. Note indicator is enclosed in glass away from dirt and weather. Glass tube is protected with rugged brass cap making glass breakage highly unlikely.

*(Optional equipment available at slight extra cost)

Now—A specially constructed tapered locknut on stem connection that refuses to let go—no possibility of inner valve spinning under high gas flows.

Now—Steel diaphragm casings of modern design for additional safety and adequate stroke for valves of all sizes.

And, the same reliable loading pilot and the other features that have made the 298 so popular among gas men are included in the new Type 298T. *Write for Bulletin P-298T.*

GOVERNOR COMPANY

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RESEARCH FOR BETTER GAS PRESSURE CONTROL

FISHER Since 1880

Sherman Power Digger Digs Six to Eight 60 Foot Trenches, 7 Feet Deep, in a Single Day!

Five Sherman Power Diggers, averaging 40 hours of work each, every week, are doing more than their share to maintain the position of Bell Plumbing and Heating Co., Denver, as one of the nation's major contractors.

As Mr. William Stecher, plumbing superintendent for Bell, puts it, "We have found that this equipment can dig six to eight sixty-foot ditches a day. All of them are seven feet deep. I would guess that each machine does the work of six men at about one half the price."

In addition to digging trenches for water and sewer lines, the Shermans are used for a variety of other digging and trenching jobs about the building sites.

With their Shermans on the job, Bell Plumbing and Heating no longer has to sub-contract normal digging jobs. Before purchasing the units, schedules often had to be adjusted for the sub-contractor and delays of several days were not uncommon. Now, work is completed on schedule.

Sherman Power Diggers can cut costs and speed production for your company, too. See your local Ford Tractor dealer TODAY for a demonstration or write for free Bulletin No. 450.

See the Sherman
Power Digger soon
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Geo:—
Considering raising
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Better check this—
Now good up to
400 psi
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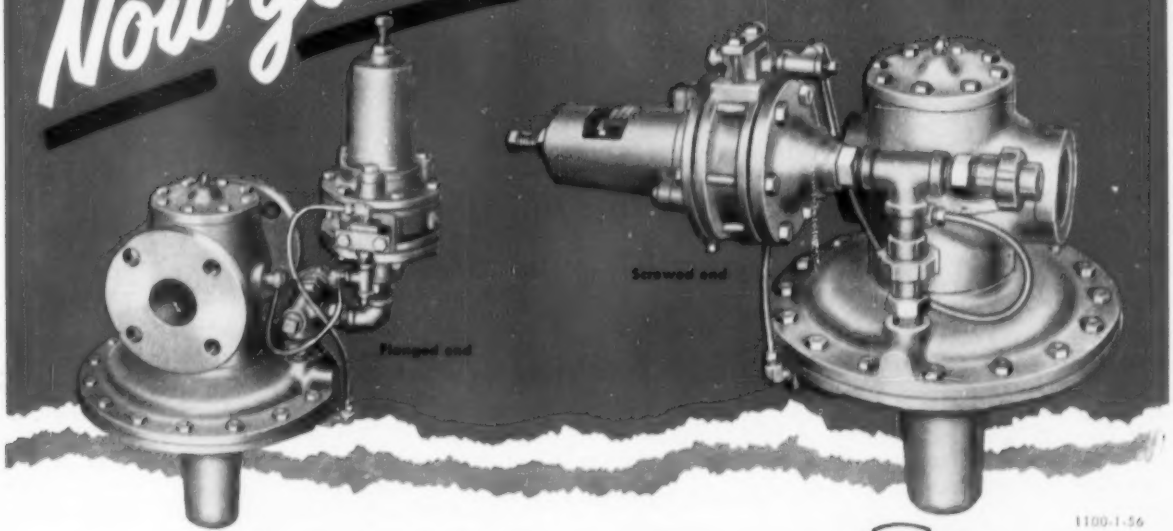
Chaplin-Fulton '1100' REGULATOR

Now good up to 400 psi



1100-1-56

Now, more versatile than ever—good up to 400 psi. Your choice of three body assemblies—

2" flanged 250 lb.	rated for 400 psi
2" screwed end	rated for 400 psi
2" flanged 125 lb.	rated for 175 psi

All suitable for outlet pressure range from ounces to 150 psi with no change required in regulator or pilot—just change the pilot spring. It's accurate—versatile—compact! A good buy!

Why stock two, when Model '1100' will do?

And, if 400 psi is too low, why not try the all-steel Model '1200', good up to 1200 psi inlet and 600 psi outlet?

Full information on request.

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MANUFACTURING COMPANY
Pittsburgh 35, Pennsylvania

"PHE" COMPRESSOR

serves growing plant-air load at Rotary Electric Steel Co.

WHEN the Rotary Electric Steel Company of Detroit, Mich., increased plant capacity, the existing plant-air supply was also increased by adding the Ingersoll-Rand 100-hp PHE compressor shown above. The extreme simplicity of this installation is obvious at a glance.

The main air supply consists of two Ingersoll-Rand duplex, electric-driven compressors totaling 500 hp. After serving for 40 years they are still giving entirely satisfactory performance.

The new PHE unit is a compact, packaged-type, two-stage air compressor with built-in motor and efficient intercooler. It was shipped completely assembled, ready to run. Installation was simply a matter of mounting the unit on a small foundation and connecting the air, water and power lines. And like many other modern Ingersoll-Rand compressors the PHE has full-floating aluminum bearings that need no adjustments.

Ask your I-R representative for full details on the smooth-running PHE compressor. Its inherent longevity and low maintenance requirements mean big savings in air power costs.

Only I-R Compressors have CHANNEL VALVES

Known the world over for High Efficiency • Quiet Operation
Durability • Air-Cushioned Action • Corrosion-Resistance
Freedom from Warping • Long, Trouble-Free Service

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T-430

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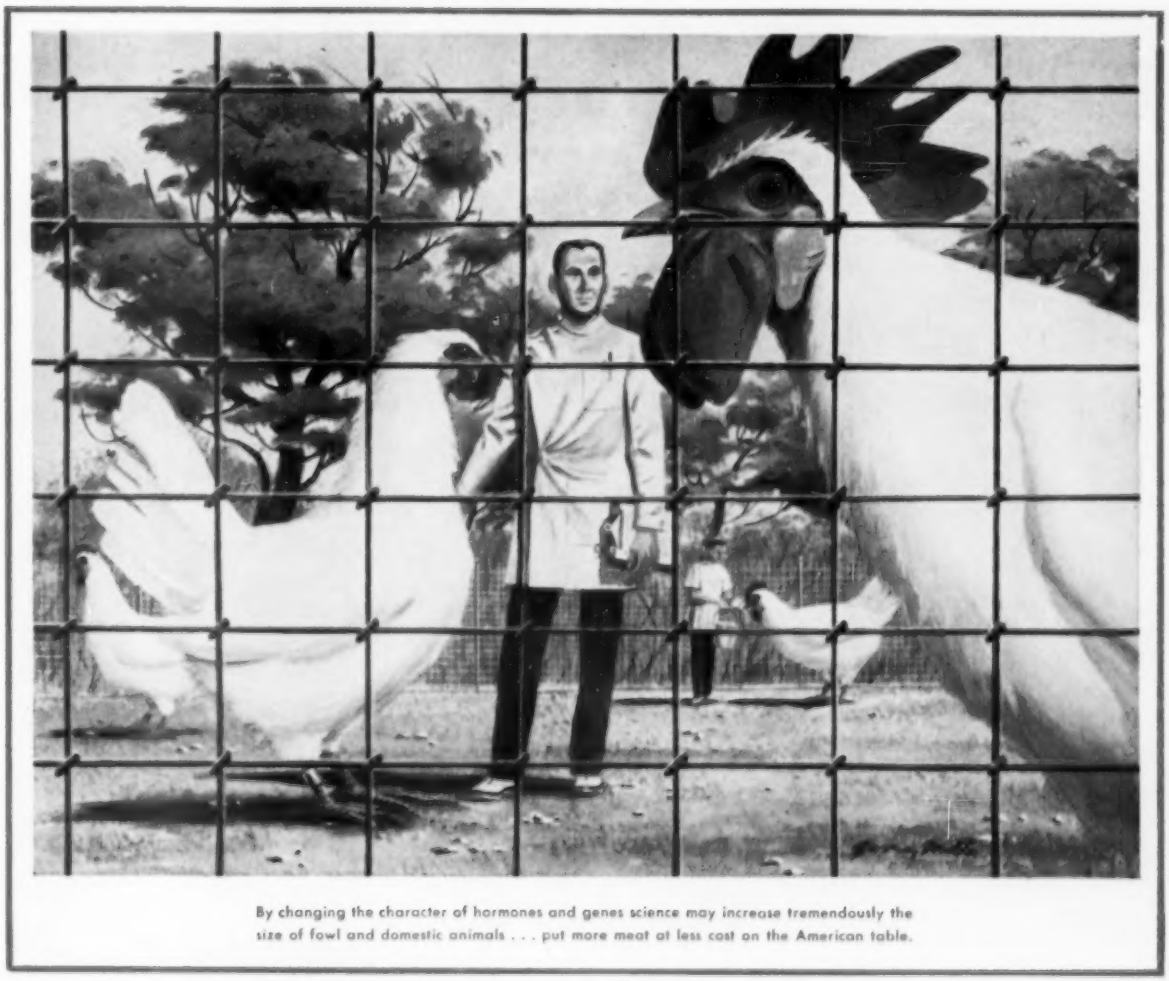
COMPRESSORS • ROCK DRILLS • AIR & ELECTRIC TOOLS
GAS & DIESEL ENGINES • TURBO-BLOWERS • PUMPS



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100 years from now...

WE MAY RAISE CHICKENS AS BIG AS OSTRICHES!

How will we live, eat, travel in the future? Even scientists must include some guesswork in their predictions of the marvelous things to come. But one thing seems certain—water and gas will still be carried by the dependable, long-lasting cast iron pipe laid today. Here's proof! More than sixty American cities are still being served by cast iron water and gas mains over a century old. And today's modernized U. S. Pipe...centrifugally cast, quality controlled . . . is even stronger, tougher, and more durable.

U. S. Pipe is proud to be one of the leaders in a forward-looking industry whose service to the world is measured in centuries.

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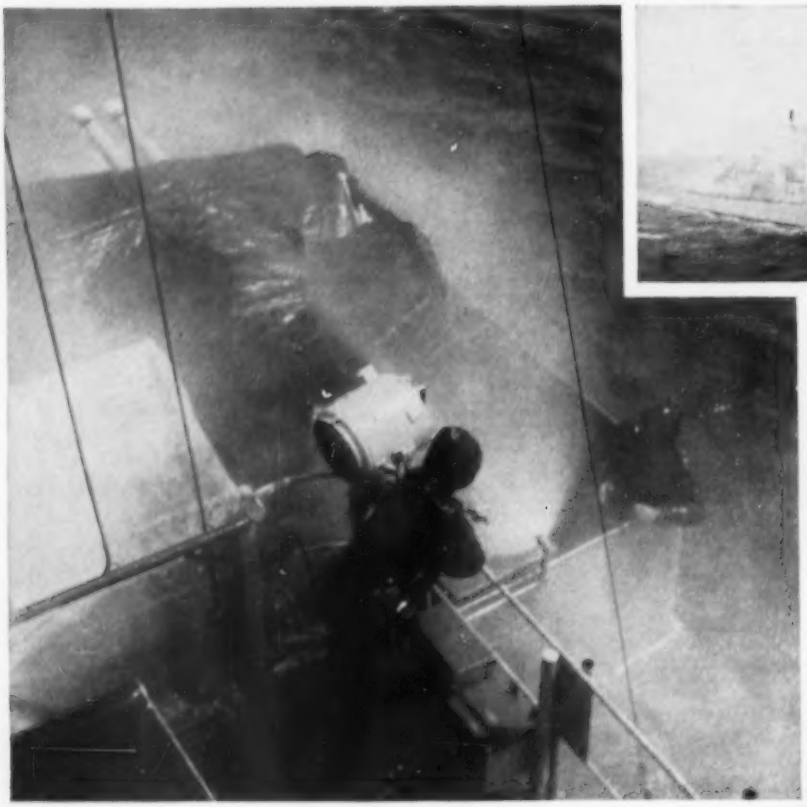
U. S. PIPE AND FOUNDRY COMPANY, General Office: Birmingham 2, Alabama

A WHOLLY INTEGRATED PRODUCER FROM MINES AND BLAST FURNACES TO FINISHED PIPE.

Another new development using

B.F.Goodrich Chemical *raw materials*



Pipe and fittings of Geon are joined easily with solvent cement, simplifying installation.

Now ships shower themselves

to wash away radioactive contamination

NUCLEAR explosions produce a deadly byproduct—radioactive fall-out. As a counter-measure, the Navy has devised a washdown system which enables a ship to spray itself with thousands of gallons of sea water, washing away contamination within minutes.

First, metal piping was tried for the system—but it added too much weight. The answer was found in rigid vinyl plastic pipe, made of Geon polyvinyl materials. This piping weighs but one-fourth as much as metal. It's impervious to sea water's corrosive effects, unaffected by either freezing or tropical temperatures. And, using simple but strong solvent-welded joints, it's so easy to install that the ship's crew can do the job easily. The washdown system was developed by the U. S. Navy's Bureau of Ships. The Grinnell Company, Inc. was the principal contractor in this effort.

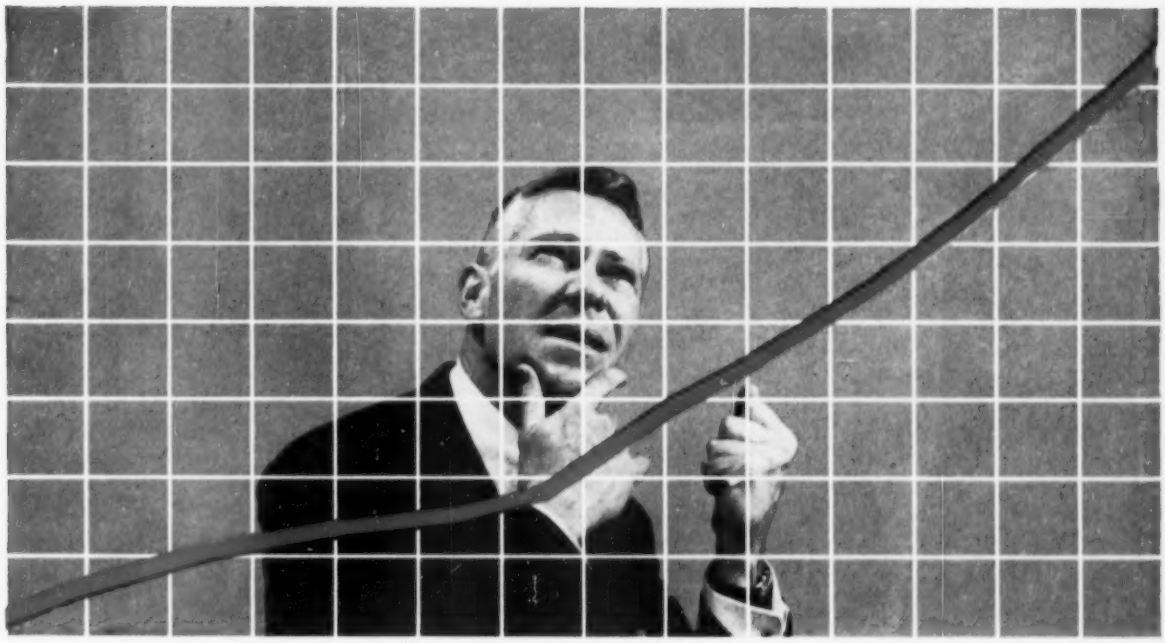
This is only one of the many applications of Geon polyvinyl materials, ranging from rigid products like ductwork to flexible products like upholstery, from coatings for textiles and metal, to foam for cushioning and crash padding. Investigate this remarkable material for *your* products.

For more information write Dept. DM-6, B. F. Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, O. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

B.F.Goodrich Chemical Company
A Division of The B.F.Goodrich Company

B.F.Goodrich **GEON polyvinyl materials • HYCAR American rubber and latex • GOOD-RITE chemicals and plasticizers • HARMON colors**

Would Rising Demands for Gas *Catch You Short?*



It will pay you to install a supplementary Philgas* system.

In times of peak demand you need a Philgas stand-by system to augment your gas supply on short notice. A Philgas system is inexpensive to install. Our technical representative will advise on the installation and the most desirable way for you to use Philgas.

Philgas is an exceptionally clean gas, free from contaminants. It is uniform in gravity and thermal value. And because a Philgas system is completely automatic it will save you money on labor costs.

But probably the most important consideration in installing a stand-by system is to have a safe, sure source of supply for times of increased demand. With a Philgas stand-by unit, you are assured of dependable supply *at all times*. Write for information.

PHILGAS Is America's Largest Selling Brand of LP-Gas!

Phillips 66 Philgas
THE ALL-PURPOSE FUEL

*PHILGAS is the Phillips Petroleum Company trademark for its high quality LP-Gas or bottled gas (propane, butane).

PHILLIPS PETROLEUM COMPANY

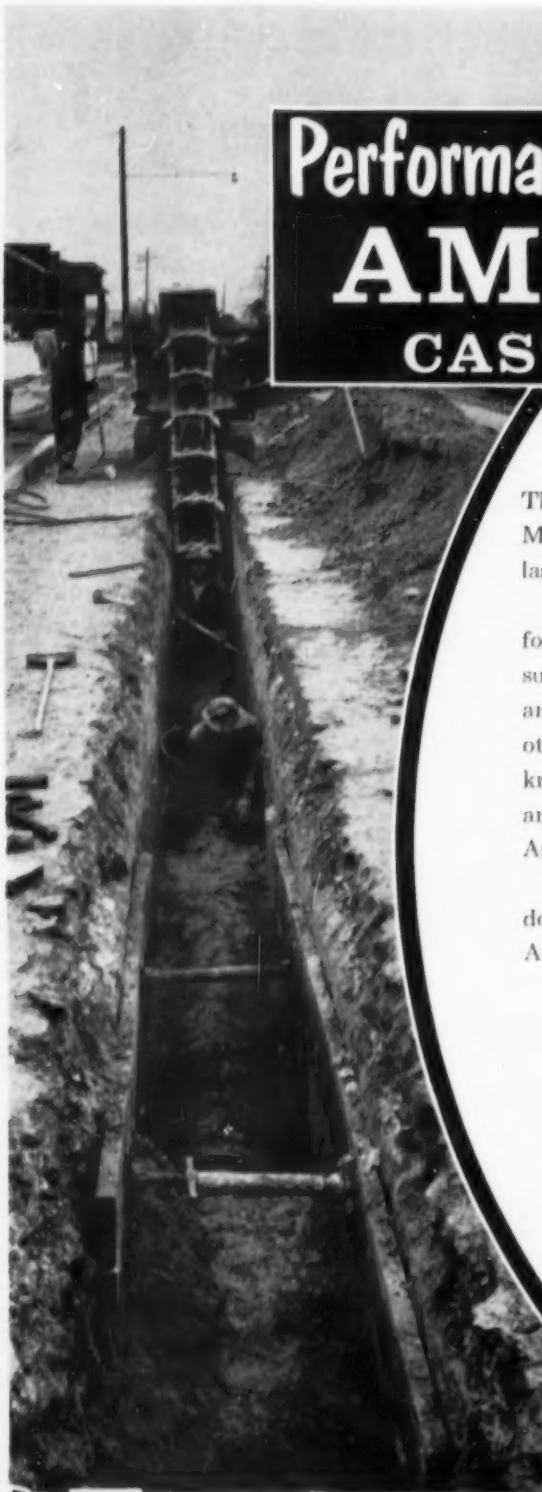
Sales Department • Bartlesville, Oklahoma

Offices located in

Amarillo, Tex., Atlanta, Ga., Chicago, Ill., Denver, Colo., Des Moines, Ia., Houston, Tex., Indianapolis, Ind., Kansas City, Mo., Minneapolis, Minn., New York, N. Y., Omaha, Nebr., Raleigh, N. C., Salt Lake City, Utah, St. Louis, Mo., Tampa, Fla., Tulsa, Okla., Wichita, Kans.

Performance... under pressure

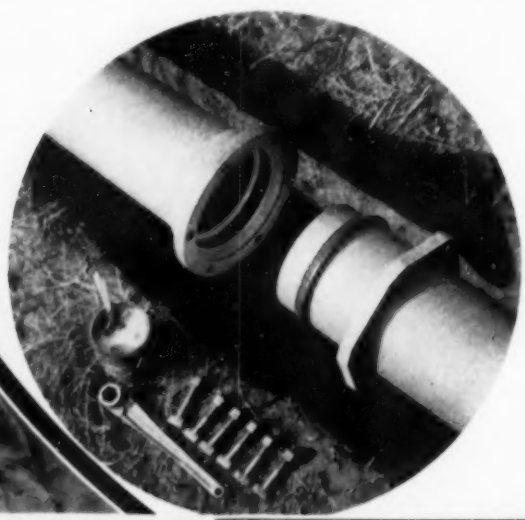
AMERICAN
CAST IRON PIPE



The gas main being installed here is American Double-X Mechanical Joint Pipe . . . bottle-tight, rugged, longer-lasting cast iron pipe.

Because the Double-X Joint was specifically designed for gas service — engineered for performance under pressure — it has been the choice for thousands of municipal and industrial gas installations. In these, as well as in other utilities and industries, American Cast Iron Pipe is known for its record of dependable, trouble-free performance. Because its annual cost has proven to be lower, American Cast Iron Pipe is also known for its economy.

If you are under pressure to get the most for your pipe dollar, get all the facts about American Cast Iron Pipe. An experienced representative is as close as your phone.



AMERICAN CAST IRON PIPE CO.
BIRMINGHAM 2, ALABAMA

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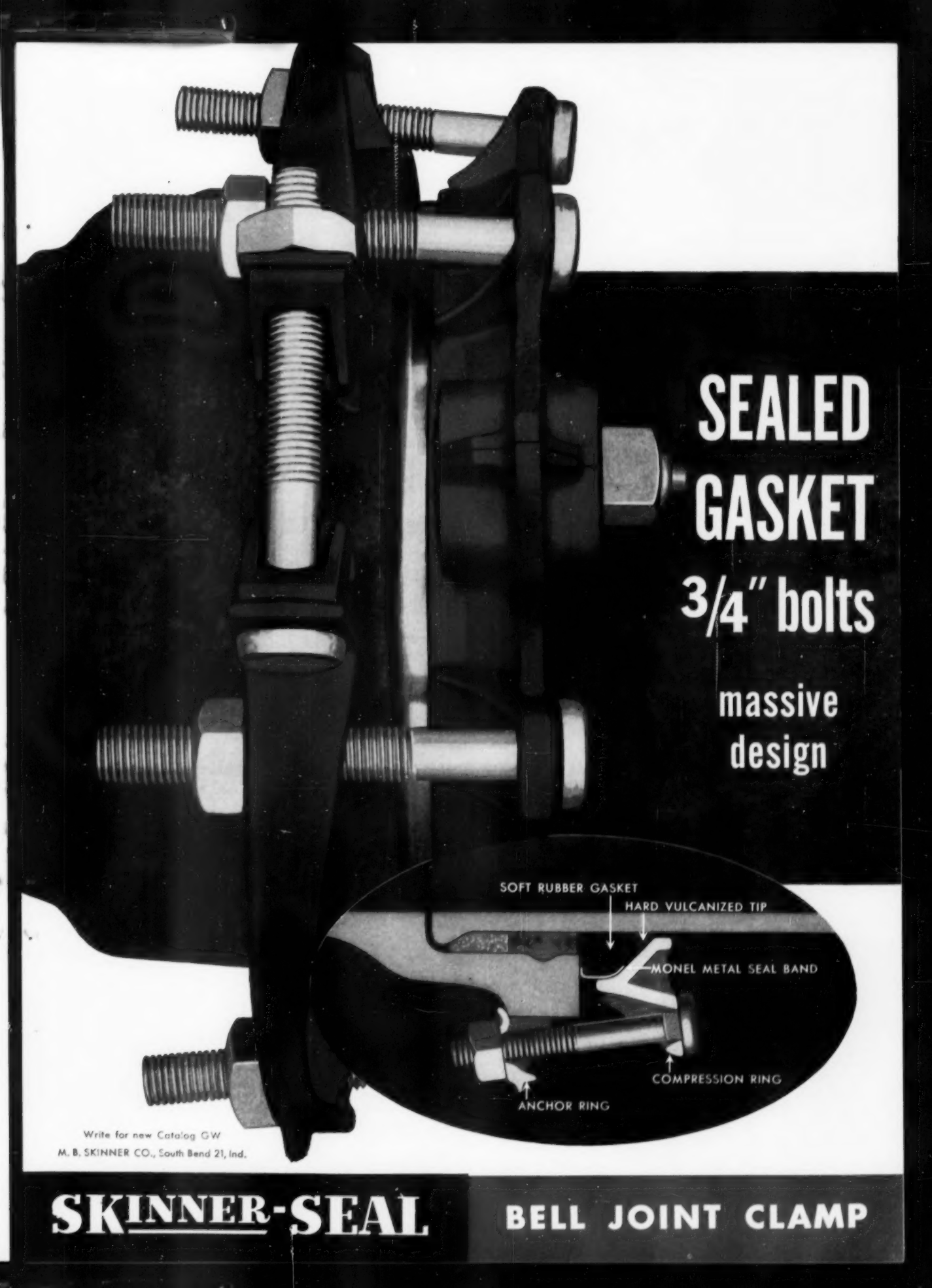

SEALED
GASKET
3/4" bolts
massive
design
SOFT RUBBER GASKET
HARD VULCANIZED TIP
MONEL METAL SEAL BAND
COMPRESSION RING
ANCHOR RING
Write for new Catalog GW
M. B. SKINNER CO., South Bend 21, Ind.
SKINNER-SEAL
BELL JOINT CLAMP

New "DRESSERLOY" Bolts answer industry problem!

Here's the latest in a long line of Dresser "firsts", the new corrosion-resistant "Dresserloy" Bolts that mean longer and more dependable service life for Dresser Bell Joint Clamps.

By providing a bolt of superior metallic structure, Dresser gives promise of solving the problem of bolt corrosion . . . the concern of all gas operating men. Added advantages are the elimination of breakage possibilities and costly bolt plating.

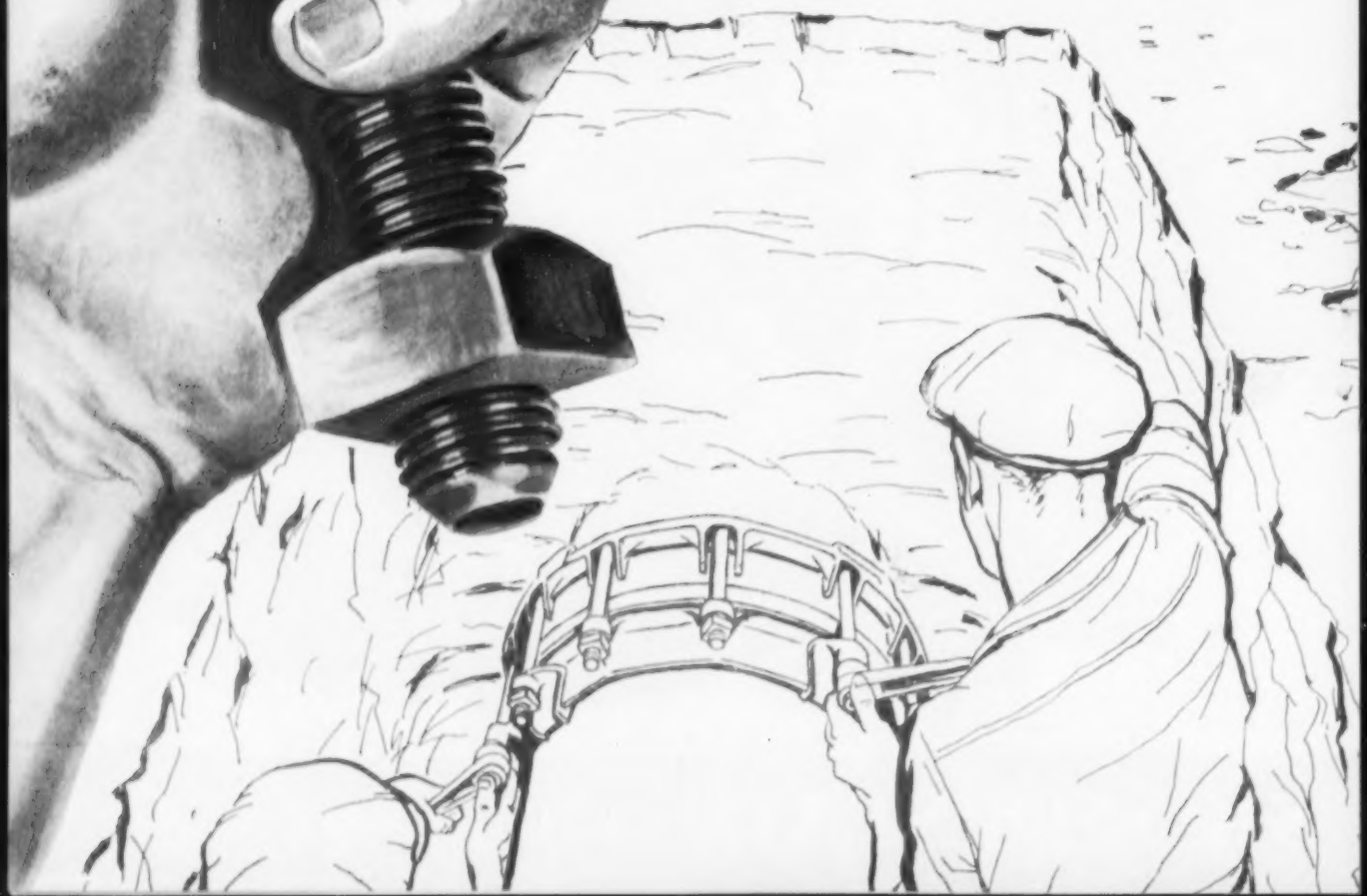
"Dresserloy" Bolts will soon be provided as standard on all Dresser Bell Joint Clamps—another significant advancement in quality to protect your company's investment.

Ask your Dresser Sales Engineer how "Dresserloy" Bolts lengthen clamp life.

DRESSER®

ONE OF THE DRESSER INDUSTRIES

DRESSER MANUFACTURING DIVISION, Bradford, Pa. Warehouses: Houston and S. San Francisco. Sales offices also in: New York, Philadelphia, Chicago, Atlanta and Denver. In Canada: Toronto and Calgary.



AMERICAN®
METER COMPANY

American announces
another completely new
welded steelcase meter

New Advanced Design AMERICAN "W" Series Steelcase Meters

- Light Weight, Welded Steelcase Construction
- Proven Speed Ratio for "Sustained Accuracy"
- Long Service Life and Lowest Maintenance Cost
- New Lifetime Corrosion Protection Coatings

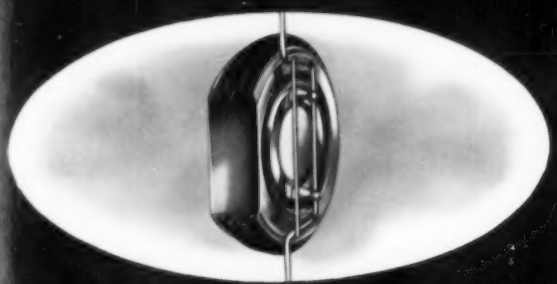
PLUS every time-tested refinement in metering developed in 120 years of progress.

MODEL W-175 Rated capacity of 175 cfh designed primarily for minimum d.d.d. applications, FOB Fullerton, Calif. Models W-210 and W-250, designed for higher d.d.d. applications, FOB Philadelphia, Pa. — followed in near future by W-300.

All meters rated with 0.64 sp. gr. gas at ½-inch pressure drop — 5 psi rated working pressure.

HANDHOLE—easily removeable. Provides hardcase meter accessibility.

INDEX BOX — external and isolated from pressure with gas-tight, frictionless rubber-grommet drive-shaft seal.



MOLDED DURAMIC DIAPHRAGMS AND REINFORCED FLAG RODS—provide trouble-free accurate service for entire meter life.

This latest advance in the science of metering is a further development of the new concept first presented in the American W-60 Welded Steelcase Meter Series.

These meters are sturdy and accurate; lighter than "hardcase" models, yet comparable in application. Every field-proven design feature pioneered by American is incorporated including: oil impregnated porous bronze bearings; plastic index boxes; interchangeable indexes — either conventional or straight reading types; adjustable tangents; and internal rubber grommet seals.

A new weather and corrosion resistant coating — standard approved ASA No. 49 gray — insures lifetime protection for all normal outdoor sets. A special impervious coating for highly corrosive atmospheres is also provided at a slight additional cost.

American's new concept in metering presents a completely new approach to meter maintenance and retirement and the W-175 is second in the series designed to bring these unusual advantages to the Gas Industry.

Consult your American Meter representative for further information.

AMERICAN®
METER COMPANY
INCORPORATED (ESTABLISHED 1816)

GENERAL SALES OFFICE: Somerton, Philadelphia 16, Penna. · Albany · Alhambra · Atlanta · Baltimore · Birmingham · Boston · Chicago · Dallas · Denver · Erie · Houston · Kansas City · Los Angeles · Minneapolis · New York · Omaha · Pittsburgh · San Francisco · Seattle · Tulsa · Wynnewood
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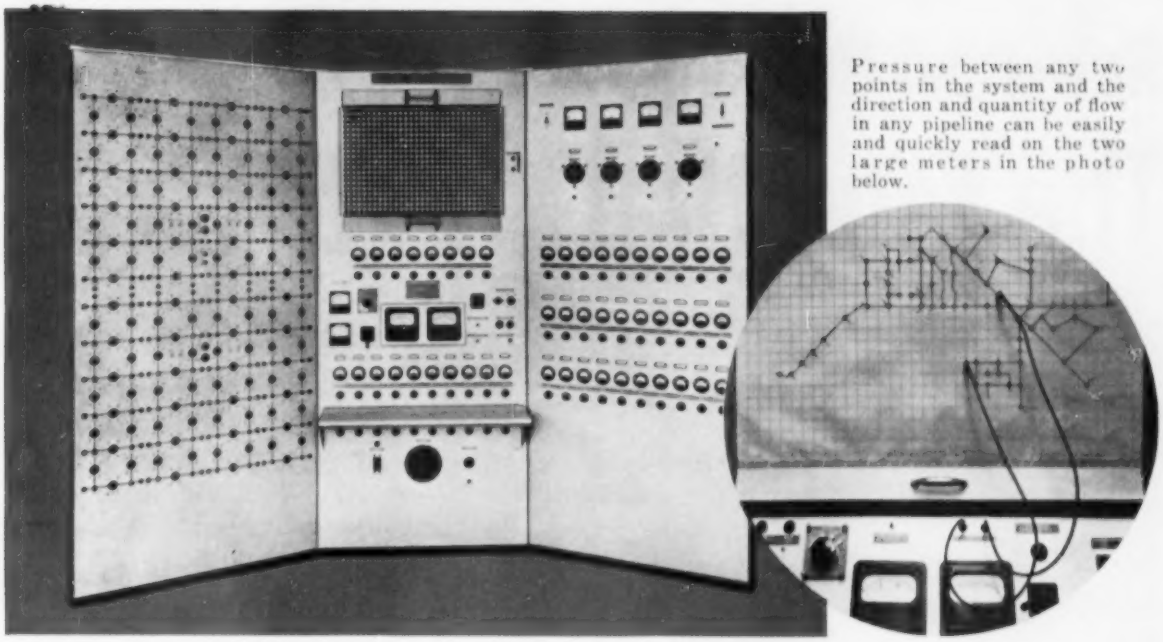


Pressure between any two points in the system and the direction and quantity of flow in any pipeline can be easily and quickly read on the two large meters in the photo below.

SIMULATE YOUR SYSTEM with the McILROY FLUID NETWORK ANALYZER

Loads represented fully automatically by constant-current electronic circuits.

Do you realize that hidden weaknesses in your plans can be quickly detected when tested on the McIlroy . . . that alternate plans can be quickly devised and a successful solution developed all in a few hours?

"LOOK WHAT HAPPENED TO OUR PLANS WHEN TESTED ON OUR McILROY"

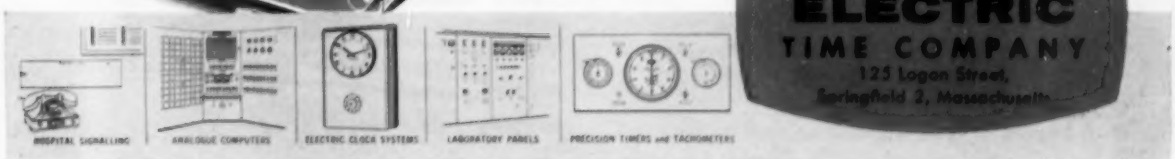
"We found a section of proposed 12-inch main would not improve pressures as anticipated; would have wasted thousands of dollars. A proposed source would improve conditions over too small an area. New load growth would cancel any benefits of our plan in only three years.

"So, after testing 15 alternate plans, we selected a final plan which gave us not only the proper margin of safety for growth but assured maximum benefit for every dollar invested.

"***AND WHAT'S MORE,*** testing the 15 alternate plans and developing our final plan took only 18 hours on the McIlroy Analyzer."

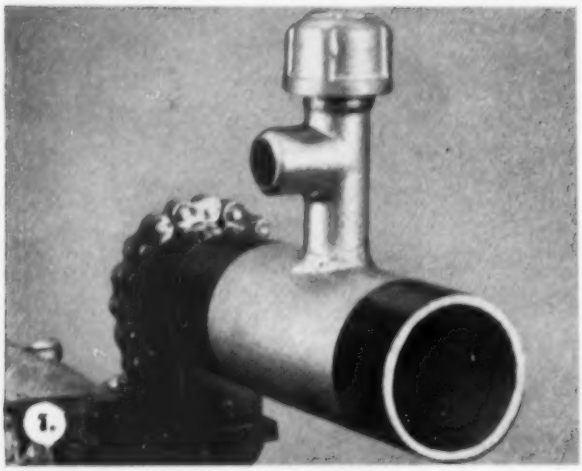
SEND FOR BULLETIN #183

STANDARD ELECTRIC TIME COMPANY
125 Logan Street,
Springfield 2, Massachusetts



New from Polyken

The tape that fits to a "T"



A remarkable ability to conform to irregularly shaped contours . . . plus all the advantages of polyethylene

(another example of
"CONTROLLED STRENGTH"
in Polyken protective coatings)

Three easy steps in wrapping a T-joint with *Polyken* Polyethylene Tape No. 940. Note the way this highly conformable tape adapts itself to every twist and turn.

If you have pipe contour problems, this one's for you. Where you need it, it's a valuable new companion product to *Polyken* No. 900 polyethylene tape coating—the ideal coating for straight-pipe runs.

***Polyken* No. 940**—is made especially for use on valves, fittings, ells, T-joints and other irregularly shaped pipe connections. All the superb corrosion resistance of polyethylene . . . plus an extremely high degree of conformability.

No. 940 is a truly balanced product which offers the right combination of elastic memory and dead stretch. Financially, it can mean a nice saving on maintenance.

We'll be glad to figure application costs on your job. Write, wire or phone today: The Kendall Company, Polyken Sales Division, Dept. G-K, 222 West Adams Street, Chicago 6, Illinois (RAndolph 6-4250).

Complete catalog, Sweet's Industrial Construction File, Sec. 6c Ke

Polyken®

CONTROLLED STRENGTH

PROTECTIVE COATINGS

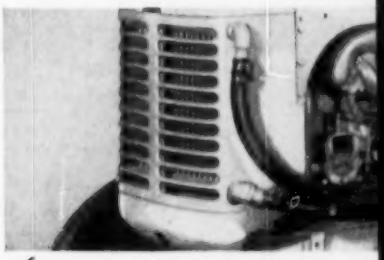
The Kendall Company, Polyken Sales Division

Check These Points Thoroughly
before buying a combination Tractor-Compressor

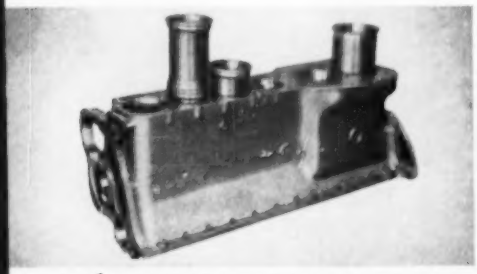
Absence of these engineering design features can mean less work done and more cost on your next job.

In recent years, combination tractor-compressor units have been increasingly popular. This is due, in large measure, to the fact that machines of this type are much easier to keep at work all day than their counterparts: an ordinary tractor and a standard portable compressor. To insure that you get the maximum benefit from any combination tractor-compressor unit, check these important points before buying.

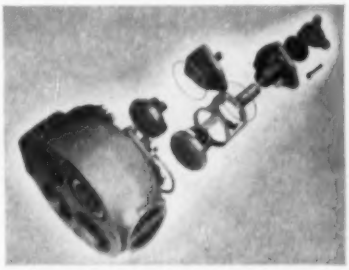
✔ **Location of the compressor air receiver** is important. The air receiver must be exposed to give you cool outside air in every operating condition, and should not hug the hot engine or be located next to the gas tank.



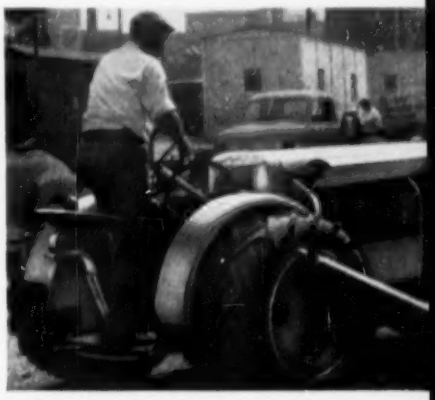
✔ **An air-cooled aftercooler** permits the tractor-compressor to deliver clean, cool, dry air hour after hour. Best cooling results can not be obtained from those units using a water-cooled manifold as an aftercooler.



✔ **Replaceable wet sleeves** in the cylinder construction of your tractor-compressor eliminate costly reboring jobs, and give you more efficient cooling by directing a 360-degree flow of water around each individual cylinder.



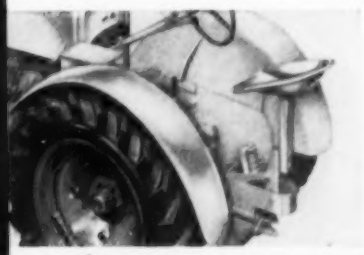
✔ **Interchangeable and replaceable compressor valves** let you get longer service life from your tractor-compressor. This feature also lowers your maintenance costs and assures top performance.



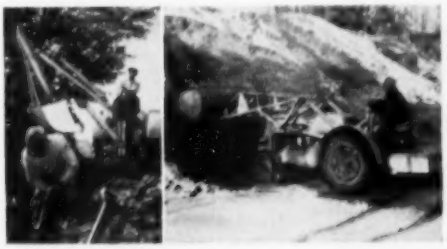
✔ **Plenty of operating space** is important, too. Be sure that your tractor-compressor permits the operator to drive and work efficiently and safely. He should be able to stand up while operating the unit.

✔ **A hood that is easily and quickly removable** helps reduce the time needed for minor repairs on your tractor-compressor. It permits preventive maintenance practices, too. Ask for this feature.

✔ **The fastest possible travelling speed** is a time-saving feature of the tractor-compressor. Be sure that your unit can get you from job to job in the shortest possible time.

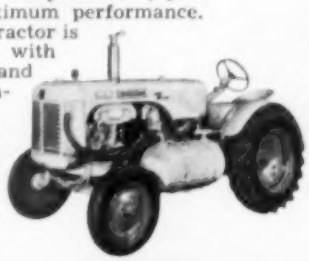


✔ **Wrap-around fenders are a must.** This is a major safety factor, particularly when the tractor is operating on rough ground or on highways and streets.



✔ **Many attachments for use with the unit** give you greater job versatility. Be sure your machine is designed for use with attachments such as the front-end loader, backhoe, and other tools.

✔ **If it's built and designed by one manufacturer** as a complete unit, you can be sure of maximum performance. Make sure that the tractor is designed to "work" with the compressor unit and is not an ordinary industrial tractor. The engine, too, should be a product of the manufacturer offering the unit. Your unit should "belong together."

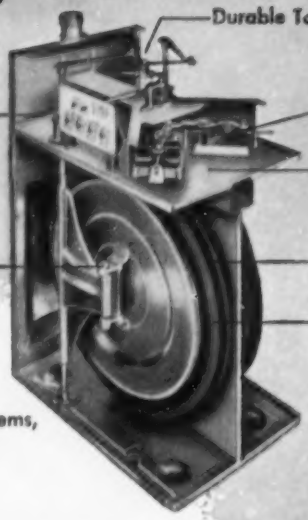


These features can be found only in the Le Roi Tractair — a combination 42-hp wheel tractor and a 125-cfm air compressor. Be sure you get *all* the savings in time and money that the engineering design of Tractair offers you. Check before you buy.

LE ROI Division of Westinghouse Air Brake Co., Milwaukee 1, Wisconsin, manufacturers of Cleveland air tools, Tractair, portable and stationary air compressors, and heavy-duty industrial engines. Write us for information on any of these products.

Y-83

Low Maintenance?



Durable Tobin bronze bushings

Precise, long-wearing noiseless valves and guides

Superior stuffing box minimizes friction, maintains uniform flag position, provides gas tight seal

Sturdy, rigid table maintains alignment, thus reducing wear

One-piece diaphragm carriage assures positive alignment

Spot-welded diaphragm rings

High quality, specially treated diaphragms

Accurate assembly methods, supervised by modern quality control systems, assure minimum wear, noise and friction

...EITHER YOU BUY IT BUILT IN...

OR YOU DON'T GET IT AT ALL!

Low meter maintenance is easy to take for granted. A meter you buy today will not cost anything at all for maintenance for 6 to 10 years. Even then it will be difficult to tell which brand of meter saves that extra few minutes in the repair shop . . . which meter best resists the effects of wear and age on valves, diaphragms, tangents, and other vital parts . . . which meter is capable of running another period or another generation without losing revenue or costing too much for maintenance.

However these points are the most vital considerations in your selection of meters.

Send for Bulletin No. 1100

SALES OFFICES: Atlanta, Boston, Chicago, Dallas, Denver, Los Angeles, Louisville, No. Kansas City, Philadelphia, Portland, Ore., San Francisco (Millbrae)

Superior Meters have been highly respected for sustained accuracy and low maintenance by two generations of meter men in the country's leading gas utilities. Ask our engineers to show you the many design details that have earned this reputation.

SUPERIOR METER COMPANY, INC.

19 West 50th St., New York 20, N. Y.

A SUBSIDIARY OF NEPTUNE METER COMPANY

superior

GAS METERS

SU-2

Proven Leadership*

*IN 1955 . . . MORE UTILITIES BOUGHT

POWERS American

SERVICE BODIES

THAN ANY OTHER MAKE

HERE'S WHY! Powers-American builds *fine* service bodies . . . and *builds them to last.*

Powers-American can furnish the *just right* body for any service job—standardized for greatest economy . . . modified-standard, to fit individual job needs . . . custom-made, to meet specific operating requirements.

Whether you have one truck or the largest fleet . . . you'll find it worthwhile to get details from Powers-American next time you need service bodies for your operation.

SERIES 350 Bodies have an under-floor winch, a fold-over derrick, and an extension ladder. Compartments are equipped to carry a variety of service tools, parts, and materials.

SERIES 25 Bodies are available in standard models equipped specifically for telephone, electric, gas, or water meter installation and service.

SERIES 44L Bodies have same construction features as Series 44 Bodies described above . . . plus a shelf-equipped superstructure, available with or without roof.

SERIES 450 Bodies, designed for light duty construction and maintenance work, are equipped with a revolving aerial ladder, an underfloor winch, and an easy-to-use derrick.

SERIES 44 Bodies . . . in 75", 90", and 104" lengths . . . are designed for service work in any phase of the utility industry. Equipped with bins, racks, material hooks, and adjustable shelves. Available with optional items to fit individual work needs.

Descriptive literature and price information is yours for the asking

UTILITIES EXPECT MORE FROM POWERS American

McCABE-POWERS

AUTO BODY COMPANY

5900 NO. BROADWAY • ST. LOUIS 15, MO. 625 CEDAR ST. • BERKELEY 10, CALIF.

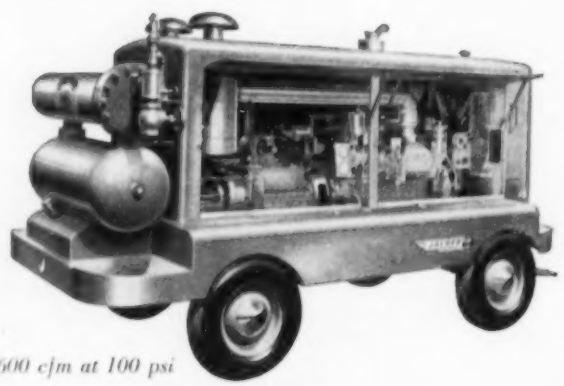
TO MINIMIZE TRAFFIC INTERFERENCE on busy Belmont Boulevard, two cuts at a time are being made on long job of replacing clamps on Nashville, Tenn. gas mains. The cuts (30″ sq. and 26″ average depth) are backfilled immediately with hot mix tamp. The compressor used is a Jaeger Air-Plus Roto® "125" because it has the capacity to run both breakers at full efficiency yet is easily trailed and light enough to spot by hand.

BACKFILLING 7 MILES OF TRENCH, A. J. Ellis Construction Co., College Park, Md. are here using a Jaeger Roto "125" with a triplex tamper. Job is laying 35,000′ of 24″ gas transmission line for Washington Gas Light Co. User reports: "We liked our first Jaeger Rotary so well we bought two more."

Jaeger 125 Rotary speeds your street work

With a Jaeger 125 "Roto" you have *constant* 100 lbs. pressure under all air demands up to 125 cfm—enough to run two 80 lb. breakers at top efficiency. You have tool boxes that hold a full set of tools. You have a machine that's easier to trail and spots by hand. And you have the most efficient rotary compressor unit built, producing air at slower engine speeds, low temperatures and with fuel economy that is money in the user's pocket.

Jaeger Rotaries are also available in 365 and 600 cfm sizes, for larger work. For complete information or demonstration, see your Jaeger distributor — or send for latest Catalog JCR5.

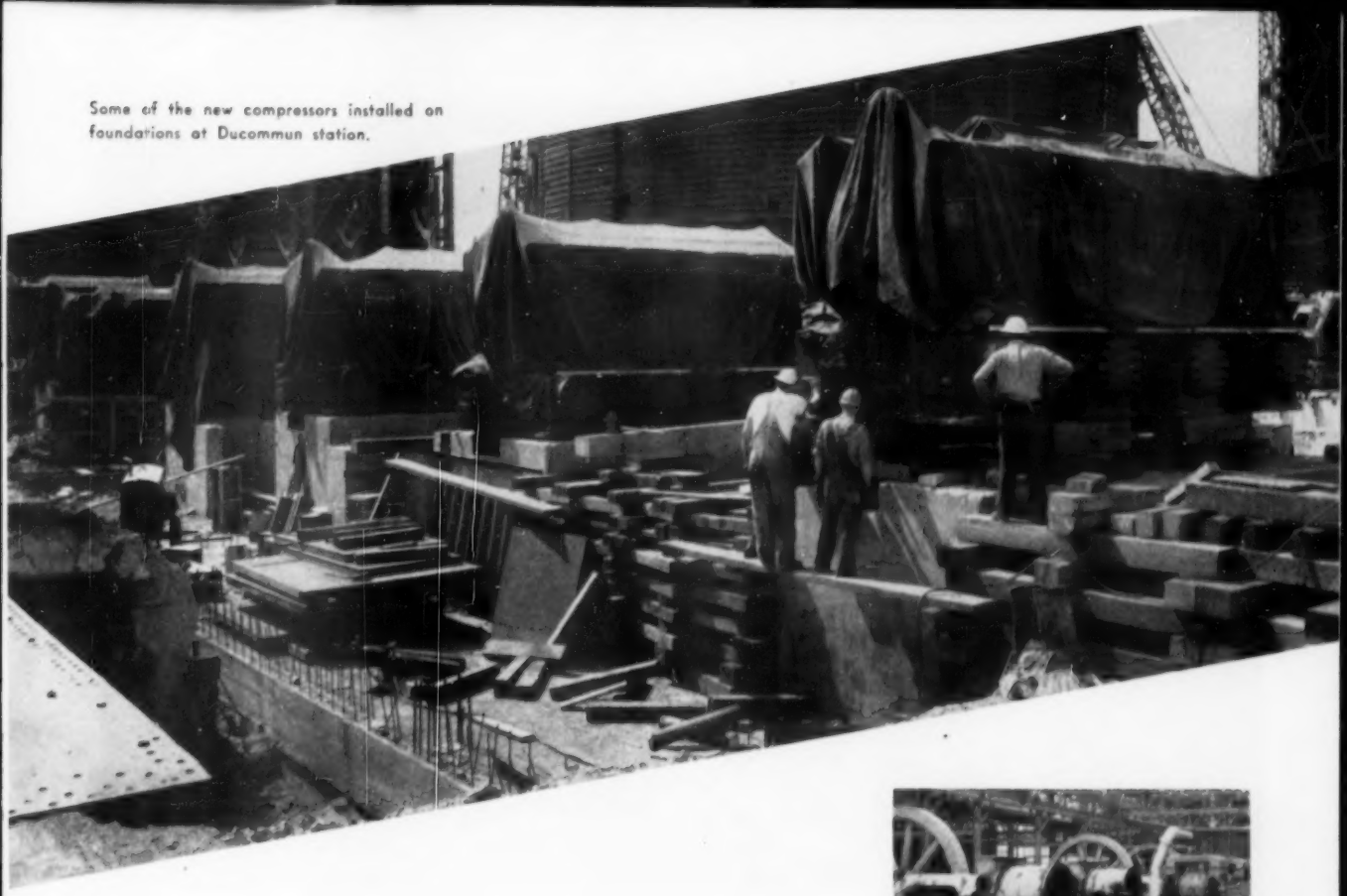


Model "600" Air-Plus Roto — 600 c/m at 100 psi

THE JAEGER MACHINE COMPANY

661 Dublin Avenue, Columbus 16, Ohio

PUMPS • MIXERS • TRUCK MIXERS • SPREADERS • FINISHERS • LOADERS



Some of the new compressors installed on foundations at Ducommun station.

SoCal unitizes compressors

Eight gas engine-driven units replace steam powered compressors to increase discharge pressure at a new utility-operated station.

Old steam compressor engines are removed to make way for modern equipment.

GAS exclusive

GAS

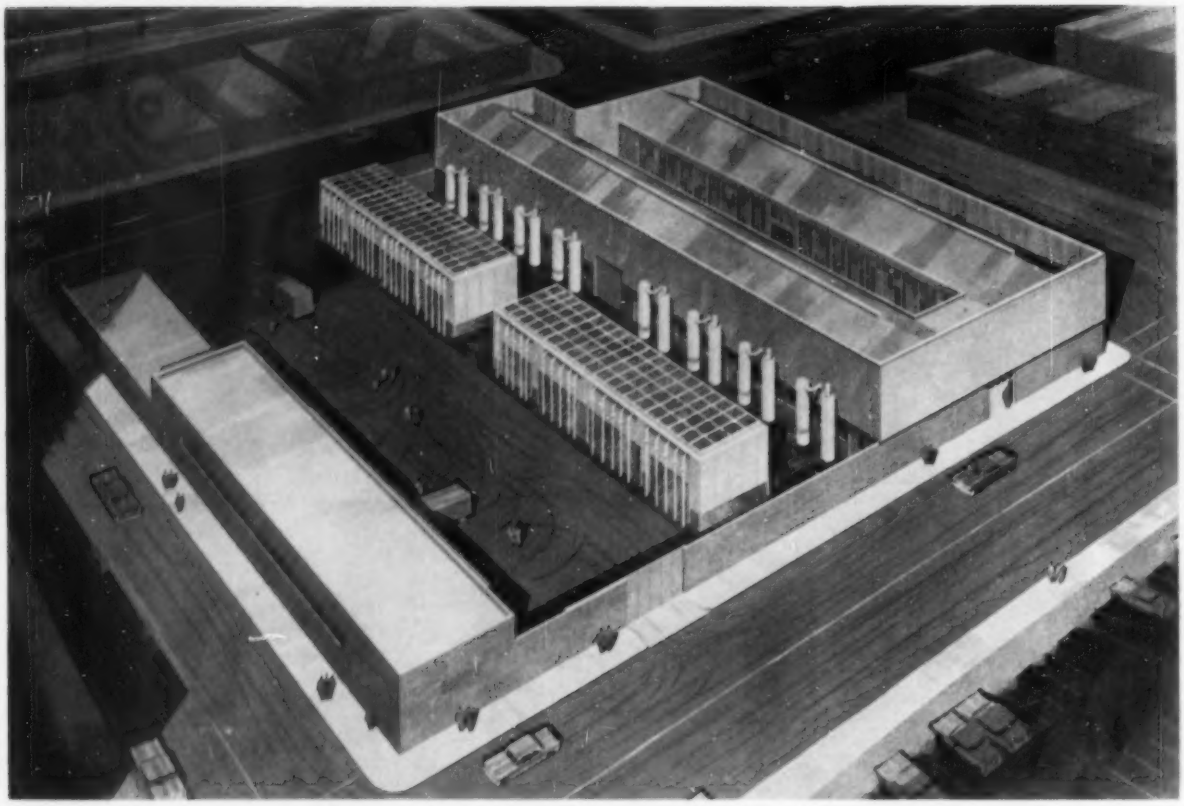
NOVEMBER 1956

By JAMES JOSEPH

A MAJOR gas distribution plant is being razed, its nine venerable steam compressors replaced by eight, 2000-hp Ingersoll-Rand turbo-charged gas engine-driven compressors . . . a $5 million modernization which will see distribution system pressures upped 10 psig in the Los Angeles area; plant capacity raised by 1.5 MMcf/hr.

Involved is Southern California Gas Co.'s Ducommun street compressor station and its nine Hamilton Corliss valve steam engines installed between 1900 and 1924. Here, during five decades, manufactured and holder-stored gas was pumped into distribution lines feeding a half dozen Los Angeles-area communities.

Now, with 1.5 million-plus customers—and gas usage steeply up—Southern California Gas Co. is investing $5 million in what prom-



This is an artist's concept of the new Ducommun St. station in Los Angeles.

ises to be among the most modern compressor stations. The gas-fired turbos are its heart.

The eight Ingersoll-Rands are type 412 KVS-2 heavy duty, direct-connected, turbo-charged, four-cycle, gas engine-driven, two-stage gas compressors. Each will be unitized for self-sufficiency.

The replacement emphasizes progress in compressor design. The old Hamiltons, each 2750-hp, had 30-ton flywheels, 5-ft compressor cylinders, needed 22 boilers (500 to 1000-hp) for motivation. Combined boiler output approximated 500,000 lb of steam/hr. Typically, each Hamilton utilized about 50,000 lb of 150-psig steam hourly. Boilers were gas-fired, but used fuel oil for standby.

During the war, four compressors were converted to butadiene production . . . basis for synthetic rubber. Working around the clock, the steam engines helped pump gas made from some 20,000 bbl of oil daily. End product was C-4 cut which was piped to Los Angeles synthetic rubber plants where butadiene was made and eventually processed into wartime rubber.

Earlier, the compressor station fed manufactured gas into Los Angeles mains.

The current modernization is practically a grounds-up operation, with most of the old station's buildings being torn down, new ones erected. Still retained as heart of the station are five big natural gas holding tanks. These are supplied natural gas from El Paso Natural Gas Co. pipelines, which link Texas, New Mexico and Colorado oil-gas fields with southern California. Roughly, 45 per cent of Southern California Gas Co.'s 90 MMcf of aboveground storage in the Los Angeles basin is concentrated near the Ducommun street compressor station in the five holders. These range in capacity from 5 to 15 MMcf. The largest is a piston-type holder, some 340 ft tall by 280 ft diameter.

Primarily, Ducommun is a regulating station. Its eight Ingersoll-Rand compressors will pump stored natural gas (from the five holders) into Los Angeles mains, working in conjunction with the utility's Spence St. compressor station, which receives gas directly from the Biggest Inch line. Ducommun and Spence gas meet in a header at Ducommun. The prime job: to keep header pressure at 70 psig and the flow approximating 10 MMcf/hr.

Typically, Biggest Inch gas—direct from the 1200-mile pipeline—may be incoming at 150 psig and at a rate of 4.5 MMcf/hr. Before entering the Ducommun header its regulated down to say 70 psig. But another 5.5 MMcf/hr must be supplied by Ducommun from storage, to keep header flow at the required distribution rate of 10 MMcf/hr.

From header, gas feeds via seven lines (14 to 20-in. diameter) to a half dozen Los Angeles basin communities and to the utility's Slauson Ave. distribution station.

Increased compressor capacity will mean higher discharge pressures into Southern California Gas' feeder lines—in effect, up the delivery capacity of these lines.

Discharge pressures, with activation of the modernized compressor station, will be upped about 10 psig (from a current 60 psig to an operational 70 psig). The utility will realize greater distribution capacity with existing lines.

The new Ducommun compressor station will be at least one major "load equation" control in Southern California Gas Co.'s system . . . its control pegged primarily to hourly differences in demand.

Storage of far larger volumes of gas—this to supply winter's heavy load and to store huge amounts of gas not needed during the low-demand summer—falls to underground reservoirs at Goleta (owned by Pacific Lighting & Gas Supply Co.) and Playa del Rey, Calif.

Thus, Ducommun's function in SoCal's system is to control hourly fluctuations in flow rates and pressures in relation to consumer and industrial demand. With the Ducommun header's discharge pressure scheduled for a 10 psig increase, more gas can be pumped into distribution lines from above-ground storage vessels. This gives the holders more versatility.

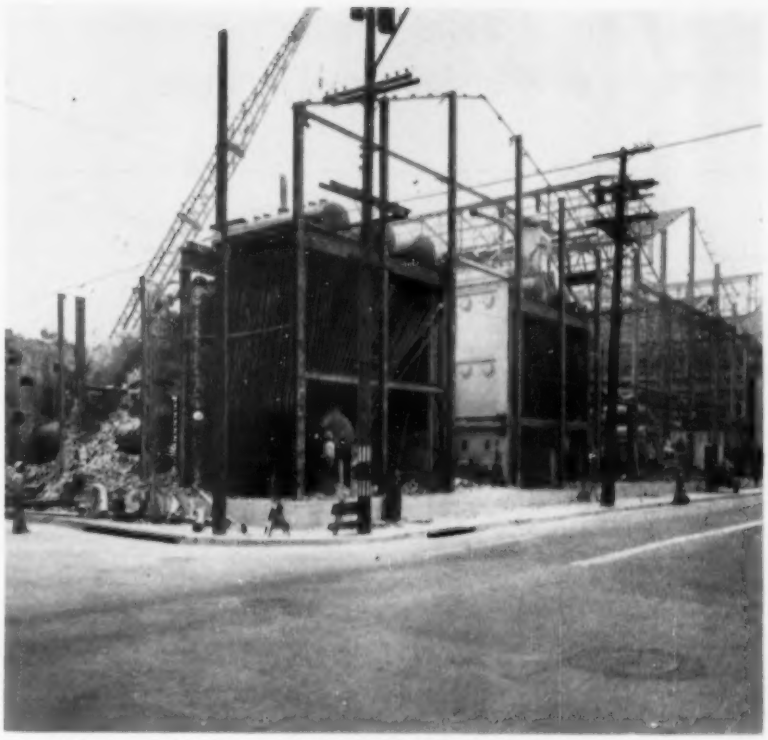
Replacing the old Ducommun St. station is a new 42-x192-ft rigid frame steel building. It'll be roofed with corrugated cement asbestos, its north and south exteriors faced in brick and metal.

The eight Ingersoll-Rand, two-stage gas compressors will be installed in-line down the building's approximate center.

Each compressor will be unitized to be capable of operating alone.

"Centralization," says a Southern California Gas Co. engineer, "would have risked shut down of all compressors should there be a central control failure. So unitization is the key. Unitization also decreed eight engines of fairly modest horsepower, rather than one or two very large engines. When we need pressure, we need it . . . and eight compressors are insurance against the failure of any one."

Tied to each of the eight is a bank of air-cooled fin fan heat exchangers. In each bank is a jacket water cooler, a gas intercooler, gas after cooler, air fan unit (a 16-ft diameter, six-bladed fan) and a LO and CC water cooler.



The old Ducommun St. station needed some 22 boilers like those shown here to operate compressors. Boilers ranged from 500 to 1000 hp each.

Construction crews pour foundations to house the eight new gas engine-driven compressors.

Unitization . . . Eight compressors are insurance against failure of any one

Driving each fin-fan exchanger is an hydraulic oil system. This system consists of hydraulic drive pumps directly connected to the flywheel end of the gas compressor, the pump output piped to a hydraulic drive motor. The motor drives right angle gear reducers, which in turn, drive the air fan. Fan speed is controlled by a manually operated bypassing of the motor. Hydraulic pumps are 300 rpm, 1000 psig, 158.5 gpm. Hydraulic drive motors are 43/36.5 hp.

Each compressor engine takes air through a Burgess-Manning intake filter. Filters are 48-in. OD, 17 ft high. Connected to each engine's exhaust manifold is a Burgess-Manning exhaust muffler.

Installed will be two Ingersoll-Rand starting air compressors, one of them a standby. The main compressor is a 3-in. x 7-in, Type ES-1 Ingersoll-Rand double acting, booster air compressor with free air unloaders, lubricator and a 15-hp motor. The compressor is V-belt driven. Standby unit is a type H-40-B two-stage, horizontal (Ingersoll-Rand), air cooled, reciprocating compressor, complete with constant speed control. Compressor is belt-driven by a Waukesha natural gas (oil field) power unit.

Station's main air compressor is an Ingersoll-Rand PHE, 12.5-in. x 7.75-in. x 6-in. two-stage, direct-connected to a 100-hp GE induction motor.

Ducommun St. compressor station, shown being razed here, stands near SoCal's big-capacity storage tanks in Los Angeles industrial section.

Compressors will also be equipped with pulsation dampeners and volume bottles—these to smooth out the pulses created by reciprocating action of compressors. Dampening eliminates one of chief causes of piping vibrations. Also, smooth, steady gas flow means less frictional resistance and less line breakage through pipe fatigue.

A first-stage pulsation dampener and second-stage volume bottle mount atop compressor cylinders on the cylinder inlet transition pieces. Pulsation dampeners are 48 in. OD x 26 ft with five 20-in. and one 30-in. major nozzles.

Horizontal first-stage volume bottles (36 in. OD x 13 ft) are connected to the bottom outlet transition pieces on the first stage compressor cylinders. Each has four 20-in. 150-lb major nozzles.

Additionally, compressors are installed with second stage pulsation dampeners. These connect to the bottom outlet transition pieces on the second stage compressor cylinders. They're 36 in. OD, 9 ft long, and each has two 20-in. and one 14-in. 150-lb major nozzles.

The compressor building is rigged with two hand-geared underslung bridge cranes. One has a 10-ton capacity, fitted with 10-ton air hoist. The other is a smaller 2-ton crane with 2-ton hoist.

Each compressor will have its individual control panel. Major controls include: (1) lube oil temperature, (2) lube oil pressure, (3) overspeed control, (4) jacket water temperature, (5) intermediate scrubber float switch, (6) fan vibrator cut-out, and (7) hydraulic oil pressure switch. Additionally, two banks (four each) of pressure switches will serve each unit.

Despite increased capacity, the new compressors will—with their auxiliary equipment—occupy less than half the space required by the now-obsolete steam-driven compressors.

Remainder of space in the new station will go for a workshop, employees' locker and change room, auxiliary generating plant, garage and receiving yard.

Engineering and construction is being handled by Guy T. Martin and Co. Inc. Consulting architects are Allison and Rible, Los Angeles. ■

Distribution company could either install a main in the street or under the foundation of a railroad overpass bridge. It chose to go under the bridge's foundation for the quickest, surest way of continuing the line.

Residential area in Solon, Ohio where East Ohio Gas Co. recently installed a new distribution system.

East Ohio Gas puts main under rail bridge to serve Solon

By **GEORGE C. BEIGIE, Engineer** • East Ohio Gas Co., Cleveland

GAS exclusive

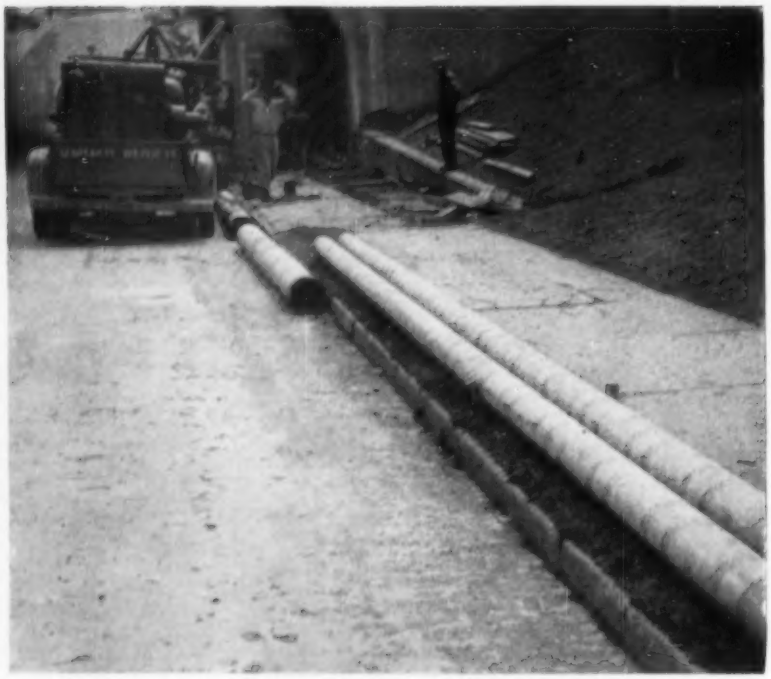
FOR the most part, piping the growing industrial town of Solon, Ohio, for natural gas was a routine job.

Located just 15 miles southeast of downtown Cleveland, Solon is three miles east of an East Ohio Gas Co. 26-in. high-pressure distribution line that runs from the Twinsburg control station to the easterly section of Cleveland.

However, in the town itself we encountered one obstacle which broke the monotony of the job—a 55-ft wide railroad overpass which we had to go under.

Solon is a town of 5000 persons and is rapidly becoming a small industrial center. Until 1947 the town's only industry was a tractor and implement company. Today, 19 manufacturing concerns, making everything from telephones to chain, have located there. All use natural gas for production.

To accomplish the $225,000 job, we let contracts to four construction firms. A regulating station was built at the junction of the 26-in. line and the distribution line



General view of the work site.

to the town. Two thousand two-hundred feet of 8-in. pipe, 35,650 ft of 6-in., 18,200 ft of 4-in., 6900 feet of 3-in., and 2900 feet of 2-in. pipe were laid in the project.

And we encountered but one major difficulty. An Erie Railroad bridge over State Route 91 was in the way of one of the main distribution lines running north and south parallel to the road.

While we could have dug up the street under the bridge and laid the line 6 to 8 ft from the curb, we were reluctant because of the heavy volume of traffic that travels Route 91. In addition, there are several sewers which angle their way to a large catch basin located right in the center of the roadway under the bridge. There also were water lines with which we would have had to contend.

So, we decided to bore under the bridge's foundation. We felt this would be the quickest and surest way of continuing the line.

The bridge was constructed without footers. Instead, each side is built on a 5-ft thick concrete pad which extends out under the sidewalks and under the streets. The ground underneath the pads is a wet, sandy loam clay. To add to the obstacles, there is a 12-in. sewer tile under the roadway at each end of the bridge. The tiles have 3 ft of cover, the same as we were maintaining over our lines.

To get under the bridge pads, the first thing we did was place a 10-in. pipe, about 15 ft long, adjacent to the south end of the footer and perpendicular to the direction of our line. With block and tackle attached, we used this as a brace or "dead man" for leverage to pull the pipe into the hole behind the auger head.

The 10-in. pipe which we used as casing was pulled by cables which ran through the block and tackle attached to the brace.

Because a sewer manhole was directly behind our work area, we had to work with 10-ft long sections of casing and then ditch-weld the lengths together.

A retaining wall, approximately 100 ft long, and paralleling our 8-ft deep work ditch presented another problem. Besides being cracked, the wall's only anchorage was a small ledge of the bridge on which it rested. The soil under the wall was of such composition that the earth continuously gave way and necessitated the erection of bracing composed of 6 x 6-in. wood skids underneath and across the

East Ohio Gas Co. crews hand coat a joint . . . elbow the main around a corner . . . and lower-in a main during the $225,000 construction program to bring natural gas service to Solon, Ohio.

Earth auger makes the bore for line passing under railroad bridge near the town of Solon.

Casing, with pulling head welded on, is brought up prior to being winched through bore.

ditch to the face of the wall.

It took us five working days to get the casing through and the 6-in. carrier pipe in and under cathodic protection. Forty-five degree welding ells at each end of the pipe brought it up to our line level of about 36-in. to cover. At one point, just north of the bridge, two gasoline transmission lines with 32 in. of cover forced us to raise our line so that it had but a 26-in. cover.

We were very happy with the results of our decision to bore under the bridge rather than attempting the other alternative of tearing up the roadway and encountering the water lines, sewer pipes and catch basin. Since we used the small lengths of pipe we were able to bore our hole levelly. We're certain by using this method we have a better job, completed in less time and at less expense, as we did not know the ground conditions existing under the roadway. ■

Casing is lowered into ditch just before pulling it under the railroad bridge.

End of casing is secured after being shoved through bore. Carrier pipe will be inserted.

New developments in design of domestic meters

Consolidated Edison has found that two sizes of meters will handle 90 per cent of its customers: 50-to-70-cfh capacity meters for range and water heater customers, and 250-cfh capacity for space heating. The company has replaced its larger meters with smaller sizes, and saved money. In many cases, it is more economical to buy a new meter than repair an old damaged one.

By JAMES WEBB, Superintendent, Meter Bureau,
Consolidated Edison Co. of New York, Inc.

THE subject "New Developments in Design of Domestic Meters" may be a little premature in the sense that at the present time the metering subcommittee of the American Gas Association is in the process of preparing standard specifications for the purchase of meters, which may bring about an entirely new concept in the assembly of meters. Therefore this subject may be classified as a supplementary progress report of the paper "New Approach to Meter Design" DMC 54-1 AGA.

There has been considerable thought and development of new ideas and methods of fabricating small capacity meters. Although the basic operating principle of the diaphragm-type gas meter has not been changed, we do have a more modern method of assembly. With all of the modern methods and equipment which are available today, we should be able to get away from the hand assembled seam.

The introduction of natural gas to the Eastern seaboard brought with it many problems, one of the most important of which pertains to metering. Many of the existing meters which have been exposed to manufactured gas are equipped with leather diaphragms. It is a well known fact that meters which have been exposed to manufactured gas will not perform satisfactorily on natural gas. Therefore, the first step necessary in a changeover from manufactured to natural gas is to consider the existing meters with leather diaphragms which have been exposed to manufactured gas.

On a recent country-wide survey, it was found that 90 per cent of the meters now in use are used to meter domestic customers. An economic study of this fact instigated three questions:

1. Are the present 5B-150-cfh meters too large for domestic customers with ranges and hot water heaters?

2. Is it more economical to purchase a new meter rather than replace the diaphragms and completely overhaul a meter which has been exposed to manufactured gas?

3. What type of diaphragm will be more satisfactory?

Relative to the first question; are we using the correct size meter? With approximately twice the Btu available with natural gas, an evaluation of our present practices in the sizing of meters will disclose that meters of too large capacity have been used to meter specific installations, such as range and water heater loads; and range, water heating and house heating loads. Meters from 50 to 70-cfh capacity for range and water heater loads, and a meter of 250-cfh ca-

pacity for house heating installations are of sufficient capacity to meter these loads. The maximum non-coincident individual 30-minute demand for range and hot water heating loads and space heating loads is shown in *Table 1*. These tests were made with 537-Btu/cu ft gas.

Meters of these two sizes will meter 90 per cent of our customers. With the load range of these groups selected, it is necessary to take a look at what size meters are available and being used. The smaller loads, such as range and hot water heater, are at present being metered with 150 and 175-cfh capacity meters. These sizes are entirely too large to meter this type of load since a 50-70-cfh meter would be satisfactory for loads of this character.

Three years ago, meters of this size were not available. This necessitated the procuring of a new meter in this load range. Before the meter manufacturers were consulted, a long range view of the meter situation was investigated. It was recognized at this time that it is good practice to replace all meters which have been exposed to manufactured gas with new or rediaphragmed meters.

If a smaller capacity meter could be obtained at a reasonable cost, an economical meter changeover program would be assured and in later years reflect in a better performance record. The same is true in the purchase of meters for new business. The smaller capacity meters can be substituted for 150-cfh meters supplying range and hot water heating loads at time of age change. The 150-cfh meters can then be used for loads closer to the rated capacity of the meter such as small space heating load.

This problem was presented to the meter manufacturers with the understanding that a meter was desired which would be high enough in capacity to cover a large percentage of our domestic customers, yet with low enough capacity to take advantage of small valve construction to insure the best possible pilot load registration. Meters were to be designed to be adaptable to 11.25-in. centers so they would be interchangeable with meters of 150 and 175-cfh capacity now being used.

With these specifications, the manufacturers brought forth several designs of small size meters with capacities from 60 to 100 cfh. The design of one of these meters was a distinct departure from the century-old design of what is commonly known as the solder-seam, tinned steel-case meter. The basic feature of this new design is that the seams are spot welded and there are fewer of them. Also, many of the parts are precision spotted and welded in the assembly operations.

For a moment, let us digress from the actual design of the meter and discuss how the assembly of this design originated.

For many years industrial, automotive, structural equipment and household appliances were manufactured and assembled with parts that could be dis-assembled for repair purposes. The automotive group was the first to take advantage of new manufacturing techniques in making the parts simpler and not repairable. By doing this, they were able to economize on the original cost and for the few replacements necessary, it was still good overall economy to replace rather than repair. If they continued to manufacture parts so that they were readily accessible, so as to provide for the few instances where repairs were required, the automobile of today would not be in the present price range. As a matter of fact, the average automobile owner of today is not interested in how he obtains performance, but that he does get economical performance. He is not concerned about being able to repair a coil when he knows that it is faster and more economical to replace with a new coil rather than repair.

Recently, two of the major eastern railroads put into service streamlined light weight passenger trains. An interesting item was noted in the descriptive data: "The coach bodies are of very light weight material and are expendable." After the coach bodies have fulfilled their usefulness they are replaced. This system resulted because of a better manufacturing technique to provide for a more efficient and economical operation. It has been recognized by the railroads, and other large users of moving and stationary equipment that to maintain large repair shops in order to keep old equipment operating is both costly and inefficient. Continual major or minor repairing of the same equipment has a tendency to pyramid maintenance costs.

If a meter could be built which would not require accessibility other than minimum facilities for adjustment, fewer seams would be needed and they could be either welded or formed by some other modern method for providing an economical assembly operation. This particular method of manufacturing provides for greater rigidity and a sounder meter case resulting in fewer leaks. With a meter of this design, the type of diaphragm to be used is very important because of the fact that the diaphragm would not be accessible.

It was decided to use synthetic

Domestic meters . . . Smaller meters cut initial costs, and require much less maintenance work

rubber diaphragms because of their resistance to any combination of chemicals. Also, they do not require any attention after they are installed. The valves had to be considered very thoroughly for a meter of this type because after the meter is enclosed, they are required to perform for many years without attention. Considering the small size of the valves, it was decided to use white metal covers with toes because of their additional weight over bakelite, thereby providing self-cleaning covers.

With this type of meter being made available and also the introduction of the smaller tinned-case meter, meters of low initial capital investment with a minimum of maintenance costs were obtained. The purchase price is such that it is more economical to buy new meters for system requirements than rediaphragm and make complete repairs on 5-light meters removed from the system. With an opportunity to retire the older meters upon removal from the system and the smaller size meters being new and more in line with the loads they are to meter, there is a tendency to improve the meter performance record at a minimum cost.

There are other savings in addition to the first saving on the purchase price; such as, handling by both the manufacturer and the purchaser. The design and construction lend these small size meters to palletizing. This is an expedient for handling from the time the meter leaves the manufacturer to the time it is installed on the system. Pallets accommodate 100 or more of these small capacity meters.

Based on years of experience, the most common faults found in the present meters were analyzed and studied to prevent recurrence in any new design. The most common faults are:

Leaks at—connections, solder seal box, partition, tops and cases.

Friction in—stuffing boxes, flag rod, flag carriage, flag rod bearing.

Wear at—flag arm bearings, crank bearings, flag rod bearing, flag carriage.

In the new design of the small capacity meter, the welded meter is a radical departure from the traditional 5B tinned-case meter, whereas the small tinned-case meter is a smaller edition of the original tinned-case meter. These meters do take advantage of many improvements in design and the use of new materials.

Let us analyze the welded construction step by step.

Before any design could be set on the drawing board, two important decisions had to be made. One, what size meter would be required to meter domestic customers with ranges and hot water heaters and, two, what type diaphragms were to be used.

It was decided to build a meter that would be capable of metering 60 cfh at 0.5-in. wc drop. The meter was to be equipped with synthetic rubber diaphragms. From past experience, synthetic diaphragms need absolutely no attention after they are installed. With this information available, the natural conclusion to arrive at was to seal the meter permanently. In addition to the diaphragms giving many years of service, the moving parts had to be considered for the same period of time.

There is only one good reason for accessibility to the meter and that is for adjustment. This was provided for through the inlet opening of the meter. To attain a permanent leak proof meter, the case is spot welded and the seams filled with solder by a newly designed mechanical method of dipping. The bottom case seams are external and protrude approximately ½ in. around the sides and bottom of the meter. This seam starts at the table top or gallery portion of the meter and is continuous around the sides and bottom of the meter. The gallery part of meter is dish shaped which forms the table, and spot welded to one piece which forms the sides, front and back of meter above the diaphragm compartments. Welded seams are filled with solder. The reinforced partition is attached to the bottom of the table and the sides and bottom are spot welded between the front and back cases. The top of the meter is spot welded and these seams filled with solder. There are six pieces for the welded meter as compared to 10 pieces for the tinned steel-case meter to form the case.

The index window is made of plastic material and installed with a synthetic rubber gasket under tremendous pressure. This plastic has very high fracture and abrasive qualities and is not affected by any of the solvents normally used in maintenance.

The inlet and outlet bushings, with tapered thread connections, are welded to the inside of the meter, virtually making it a one-piece construction. This overall type of construction practically makes the meter permanently leak proof.

Experience has proven that this type of construction is not affected by handling or strains which may be caused by improper installations. The connections with tapered threads are screwed into the inlet and outlet bushings and are spaced for 11.25-in. centers. Briefly, this covers the external picture of the welded meters. This is an entirely new departure in case construction demonstrating in a practical manner the new thought that it is not necessary to have accessibility to any parts other than for adjustment of the meter.

The designs of the internal parts are new and of improved materials. Simplification is the theme in this design. Through simplification and change of design, the manufacturer was able to eliminate many parts, and at the same time, improve the operation of the meter.

The flag stuffing boxes, crank bearing, valve grates and valve guides are precision cast into the table top in one operation. This provides for perfect alignment for all parts, thereby eliminating friction. The packing for the stuffing boxes consists of small synthetic

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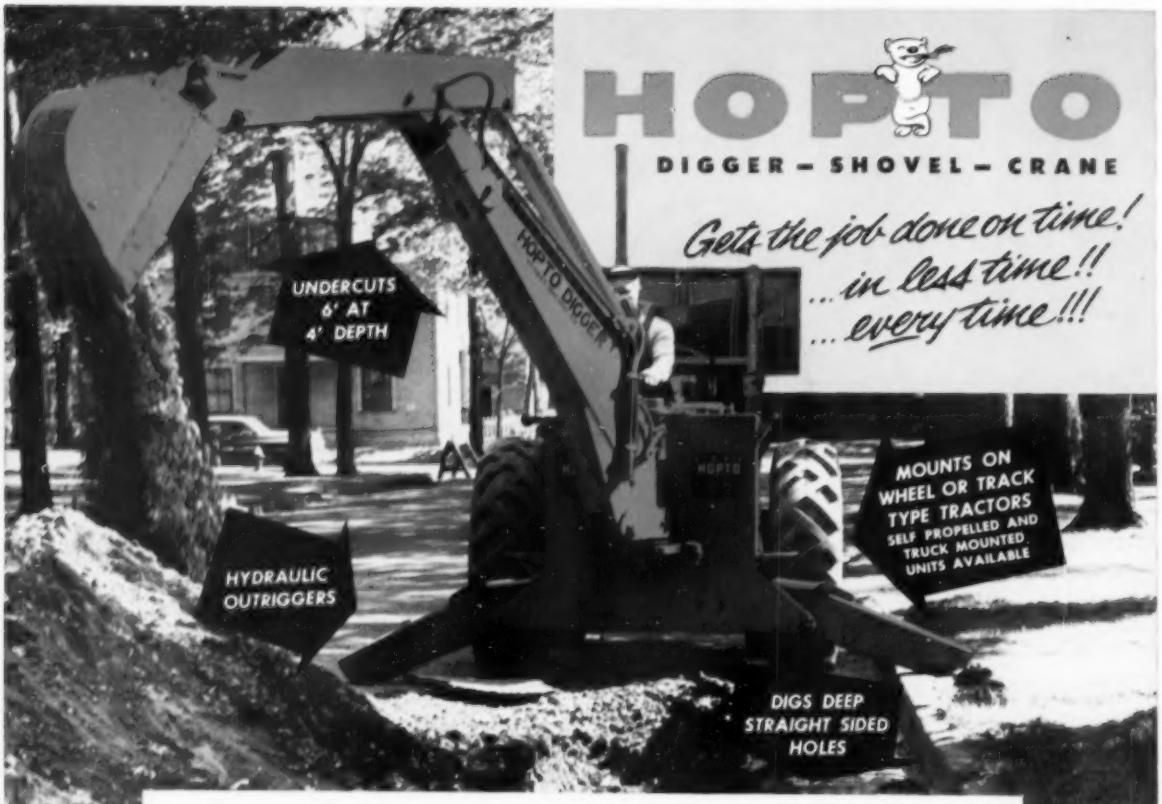
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rubber grommets. This type of packing remains uniform at all times and under all operating conditions, enabling the meter to maintain its original adjustment.

The three circle index is mounted directly to the rear of the index window without the use of feet, thus eliminating soldering.

The crank bearings are made of powdered bronze, lubricated with a non-creep lubricant. This type of lubrication is very important because it helps to prevent dirty valves.

The adjustments are readily accomplished by the newly designed horizontal adjustable tangent. The tangent consists of two screw adjustments for check and open rate tests. These screws are held in permanent position by lock nuts. These adjustment screws are accessible through the inlet opening of the meter. Adjustments are made with a single tool. A light of sufficient intensity placed in front of the index window will provide illumination inside the gallery of the meter to enable the operator to make contact with the adjustable tangent for adjustment purposes.

A test bench to accommodate this type of meter is in use for testing and adjusting. The mounting facilities consist of a quick-connector test table operated with a foot-actuated air-cylinder and equipped with a turn table mounted on the table top.

Before test, the inlet connection is removed from the meter and the meter is set in a jig on the turn table with the index of the meter facing the operator. Connection to the meter is made with the aid of the air cylinder which forces the inlet connection to the inlet side of meter and the outlet connection to the top of the screwed outlet connection of the meter (see *Fig 1*).

After open and check rate readings have been taken on the meter in the normal manner and if the results show the meter requires adjustments, the inlet and outlet connections of the test table are automatically released by release of the hand-operated air valve and the meter is turned through 90° to the right. This brings the inlet opening to the front and a light is automatically placed in front of the index window supplying sufficient light for the operator to see the adjusting screws if he so desires. Adjustments are then made through the inlet opening with the adjusting tool. With experience, the operator can easily locate the adjustments by sense of feel (see *Fig. 2*).

The synthetic rubber diaphragms are molded, which contributes to better meter performance. The inner diaphragm ring is of a pan design which lends itself to welding in position. The position of the pan is automatically located before welding which provides for uniformity in the assembly of the meters.

The flag rod construction consists of a formed rod instead of the conventional straight rod and tin flag, eliminating the flag and soldering. The flag rod is connected to the disk by means of two simple brass bearings, eliminating the flag carriage. The flag rod step-bearing is mounted in a bracket welded directly to the partition.

By simplifying the many parts, a step has been made toward greater standardization. These several changes in design to bring forth these smaller meters should not be construed as the ultimate design for meters of this category.

By taking advantage of modern methods of assembling two pieces of material together, many manual operations can be eliminated. This mechanical method also guarantees precision in assembly of parts in that all finished products are identical. This simplification has also been extended to the smaller capacity tinned steel case meters.

Prior to the introduction of the welded case meter, a tinned steel-case meter of 100-cfh capacity, much smaller in size than the 5B

Domestic meters . . . Welded meter is radical departure from traditional 5B tinned-case unit

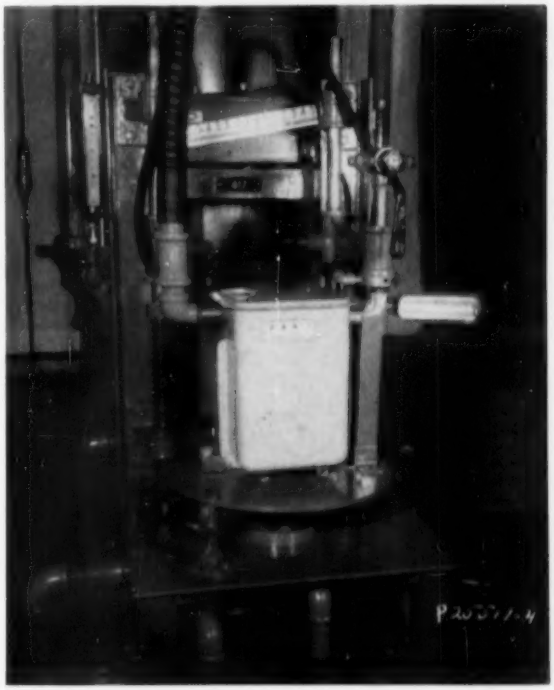


Fig. 1. Welded case domestic meter is tested on test bench. Before test, inlet connection is removed. Air cylinder is connected to meter, forcing inlet connection to inlet side and outlet connection to top of screwed outlet connection of meter.

TABLE I

Residential Gas Load Study - Single Family Dwellings
(Manufactured Gas of 537 Btu per Cubic Foot)

LOAD CHARACTERISTICS OF AN AVERAGE RESIDENTIAL GAS CUSTOMER IN A SINGLE FAMILY DWELLING

	Customer Data	Cooking	Cooking & Refrigeration	Cooking & Automatic Storage Water Heating	Space Heating, Cooking & Automatic Storage Water Heating (iv) Avg. Mean Daily Temp. 35.9 F	Space Heating, Cooking & Automatic Storage Water Heating (iv) Estimated for 0 F
1.	Number of test customers	148	84	6	65	
2.	Number of customer weeks	202	84	13	118	
3.	Test period	Jan.-Apr.'41 & Nov.'41-Apr.'42	Sept.-Nov.'41	Feb.'41 & Mar.-Apr.'42	Jan.-Mar.'41 & Nov.'41-Apr.'42	
4.	Number of persons per family	4.5	4.1	5.0	4.1	
5.	Number of rooms per dwelling	6.2	6.0	8.2	6.2	
6.	Connected load - cubic feet per hour	80.3	84.3	124.3	343.2 (iii)	
7.	Average mean daily temperature - F	37.5	60.6	41.8	35.9	
	Test Period Data and Factors					
8.	Weekly test period consumption - cubic feet	393.4	771.7	1,679.4	9,894.5	
9.	Maximum half-hour coincident group demand:					
	(a) Sunday - cubic feet per hour	11.7 (ii)	15.8	24.1	129.4 (36.8F)	-
	- time of occurrence (i)	12:30 P.M.	12:30 P.M.	12:00 Noon	7:00 A.M.	-
	(b) Maximum weekday - cubic feet per hour	9.7	10.3	27.8	154.3 (34.9F)	180.0
	- day & time of occurrence (i)	6:00 P.M. (Mon.)	6:00 P.M. (Sat.)	8:00 A.M. (Wed.)	7:00 A.M. (Fri.)	-
	(c) Average weekday (Mon.-Fri.) - cubic feet per hour	9.4	9.7	24.9	140.0 (35.7F)	-
	- time of occurrence (i)	6:00 P.M.	6:00 P.M.	8:00 A.M.	7:30 A.M.	-
10.	Maximum 24-hour group consumption - cubic feet:					
	(a) Sunday	75.1 (ii)	132.7	235.2	1,393.1 (36.8 F)	-
	(b) Maximum weekday	54.6 (Sat.)	111.7 (Sat.)	276.0 (Sat.)	1,474.7 (Fri.) (34.9 F)	2,800
	(c) Average Weekday (Mon.-Fri.)	52.5	105.5	233.6	1,409.1 (35.7 F)	-
11.	Maximum half-hour non-coincident individual demand cubic feet per hour:					
	(a) Sunday	31.0	30.3	51.3	223.0	
	(b) Average weekday (Mon.-Fri.)	21.9	22.3	48.5	225.3	
	(c) Weekly test period	39.4	38.4	57.4	241.3	
12.	Maximum 24-hour individual consumption during weekly test period - cubic feet	105.5	149.9	297.1	1,730.4	
13.	Weekly coincident group Distribution Demand Load Factor Line 8 ÷ (108 x Max. value on Line 9)	20.0%	29.1%	36.0%	38.2%	32.7%
14.	Weekly coincident group Production Demand Load Factor Line 8 ÷ (7 x Max. value on Line 10)	74.8%	83.1%	86.9%	95.9%	90.5%
15.	Half-hour Distribution Demand Coincidence Factor Max. value on Line 9 ÷ Line 11 (c)	29.7%	41.1%	48.4%	63.9%	
16.	Daily (24-hour) Production Demand Coincidence Factor Max. value on Line 10 ÷ Line 12	71.2%	88.5%	92.9%	85.2%	
	Annual Data and Factors					
17.	Annual consumption - cubic feet	21,200	37,600	77,500	269,000	
18.	Annual coincident group Distribution Demand Load Factor Line 17 ÷ (8,760 x Max. value on Line 9)	20.7%	27.2%	31.8%	19.9%	17.1%
19.	Annual coincident group Production Demand Load Factor Line 17 ÷ (365 x Max. value on Line 10)	77.3%	77.6%	76.9%	50.0%	26.3%

meter of 150-cfh capacity, was submitted by the meter manufacturers. This meter was designed for minimum overall dimensions and simplification, both of which brought about a low-cost meter. The small capacity tin-case meter is now available in 80-cfh capacity. This meter has been streamlined with small valve covers, powdered-bronze flag-rod bearings, synthetic diaphragms, one-piece top and weighs one-half as much as the 5B meter. The design of this meter lends itself to palletizing for delivery.

These small capacity meters are interchangeable with existing 150 cfh and 175 cfh meters with center-to-center dimensions of 11.25 in.

The ultimate goal in designing a meter of a capacity to more correctly meter range and hot water heating loads was to procure better performance at a lower cost.

This goal was attained by standardization and simplification of parts. As an example as to what was accomplished by simplification, the following parts have been eliminated in both the welded and small capacity tin-case meter: long channel, valve box enclosure, valve box cover, heavy packing, triangle plate, reserve stop, flag, flag carriage, index enclosure, disc guides, disc bearings, disc guide wires, two-piece top, baffles in channel, baffles in tube screw, stuffing box for index axle, center box, and considerable soldering.

The design of this meter should be one that is readily adapted to machine production-line methods, whereby a simplified design, and perhaps newer materials, could be utilized, with the following features in mind:

Materials should be strong enough to reduce case damage in handling and decrease weight.

Simplified inlet and outlet connections to decrease costs.

Design which will lend itself to compact shipment and palletizing.

Wherever possible, parts should be combined. The entire fronts and backs of meters could be made in one piece; likewise, both sides and bottom could be made as a unit. This type of assembly will decrease the number of seams required, decreasing the potential of leaks. Seams could be of a welded or pressed design which could be readily adapted for machine operation rather than hand assembly.

Provide a simple means of adjustment for accuracy which will contribute to rapid adjustment of meter.

Elimination of frictional changes in meter, as related to bearings, packings, valves, etc.

Simplification of parts to reduce load required to operate meter.

Less space requirements for installation. This is very important in large group or bank installations, and for storage and transportation.

If meters of this design can be brought about, it will result in lower investment and operating costs.

Meters of such a design could be made in two sizes: one, for range and hot water heating loads, and the other one for range, hot water heating and househeating loads, thereby decreasing the number of various size meters which are carried in stock today. ■

Domestic meters . . . Ultimate goal was to procure better performance at lower cost

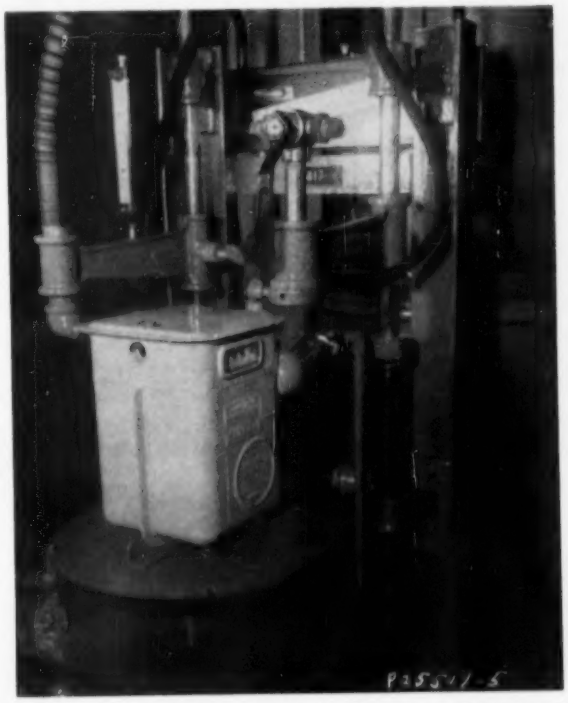
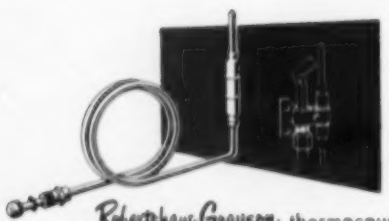


Fig. 2. If test shows that meter needs adjustment, meter is turned 90° on test bench, and light placed in front of index window. Adjustments are made through the inlet opening with the adjusting tool. Operator can locate adjustments by feel.

This article was adapted from a paper presented by Mr. Webb at the Southwestern gas measurement short course, College of Engineering, University of Oklahoma, Norman, Okla., April 17-19, 1956.

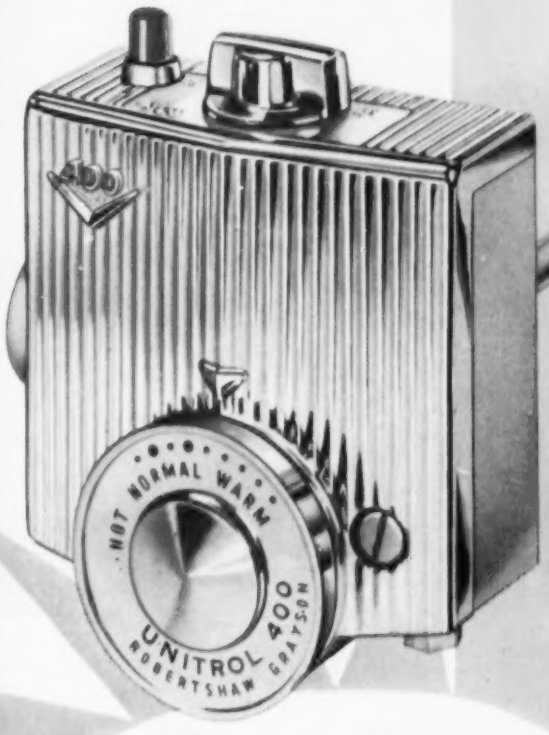
BACKED UP BY MORE THAN TWENTY MILLION CONTROLS

When the Model 400 UNITROL® Gas Water Heater Control was presented to water heater manufacturers it combined the lessons learned in more than 57 years of experience with the know-how gained in the manufacture of more than 20 million units and the knowledge accumulated by watching these controls in action under all gas and water conditions. That's why UNITROL 400 represents the finest water heater control on the market today.



Robertshaw-Grayson thermocouples and pilots belong together — because they are designed to work together.

MODEL 400



- Snap-on gas cock handle easily removed. Supplied in gold or silver.
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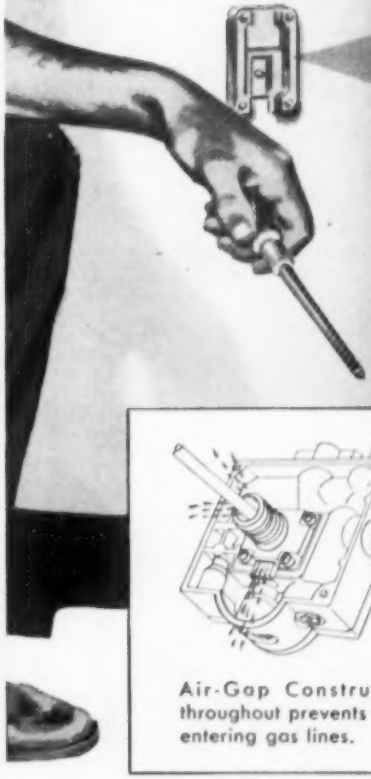
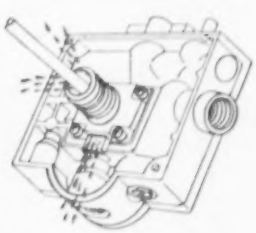
- Snap-on cover requires no tools for removal.
- Corrosion resistant valve assures positive closure.
- Easily removed gum and dust filter keeps pilot light from clogging.
- Big capacity — delivers up to 90,000 btu's per hour. 100% gas shut-off.
- Magnet assembly easily removed in the field if necessary.
- Built-in dust trap inside control keeps any dust or scale out of working parts of control.
- Easily calibrated and adjusted from the front of the control.

Control Can Be Demounted Without Draining Tank





Air-Gap Construction throughout prevents water entering gas lines.

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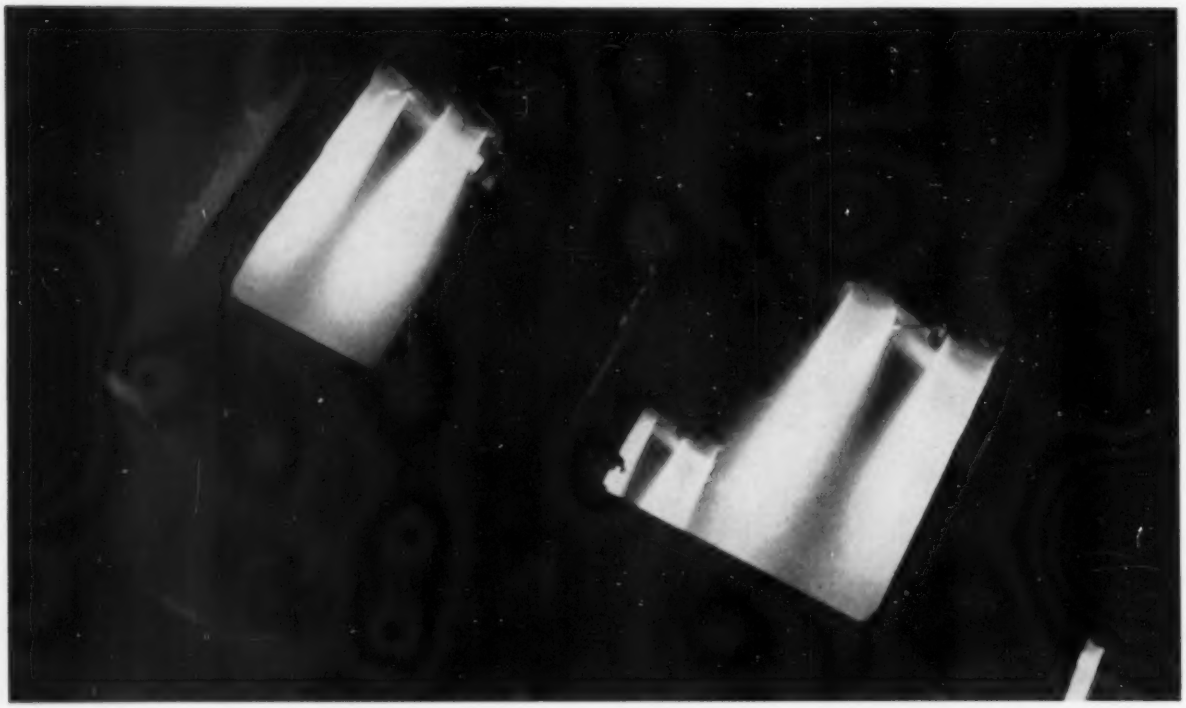
SELECT THE CONTROLS THAT HELP YOU SELL



The burners in action. Photo was taken looking up through observation ports in the burner control room.

Natural gas used to dry air for supersonic flight simulator

IN several laboratories around the nation the National Advisory Committee for Aeronautics—established by the Federal government in 1915—carries on continuous research to provide aeronautical designers with the latest in aeronautical principles. If we are to have modern aircraft to lead the world in commercial aviation, match, at least, any potential opponent in aerial warfare, ideas and innovations must refer to basic aeronautical fundamentals for axioms of flight.

NACA facilities specialists are hard at work in these tests. As one research engineer at NACA's Lewis Flight Propulsion Laboratory in Cleveland put it, "We write the latest chapters for the handbooks on fundamentals." Part of this vital program is exemplified by the recently completed 10-ft by 10-ft wind tunnel built at Lewis Laboratory for a cost of $33 million. It duplicates supersonic conditions at velocities between 1200 and 1800 miles per hour at altitudes up to 30 miles. The tunnel is the largest of its kind in the world.

Prime purpose of the machine is to work with problems of turbojet and ramjet engines. Design permits closed circuit operation (air circulating around and around) or open end function (for engines running under combustion test).

One condition required in the simulation of supersonic flight at

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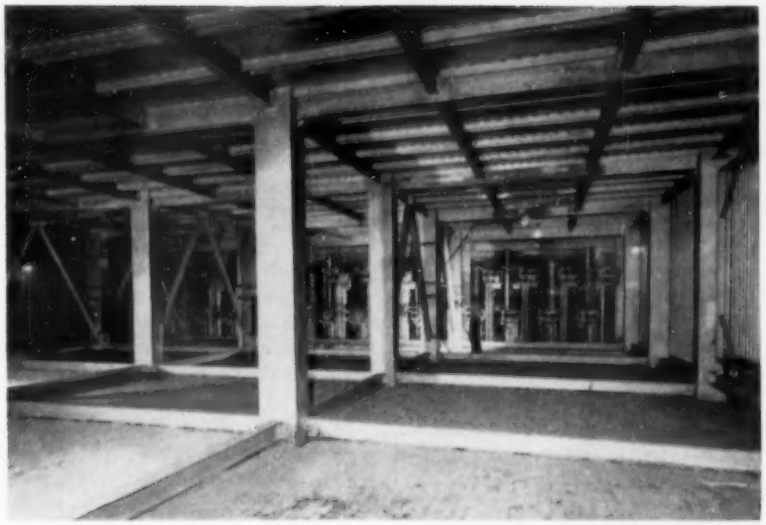
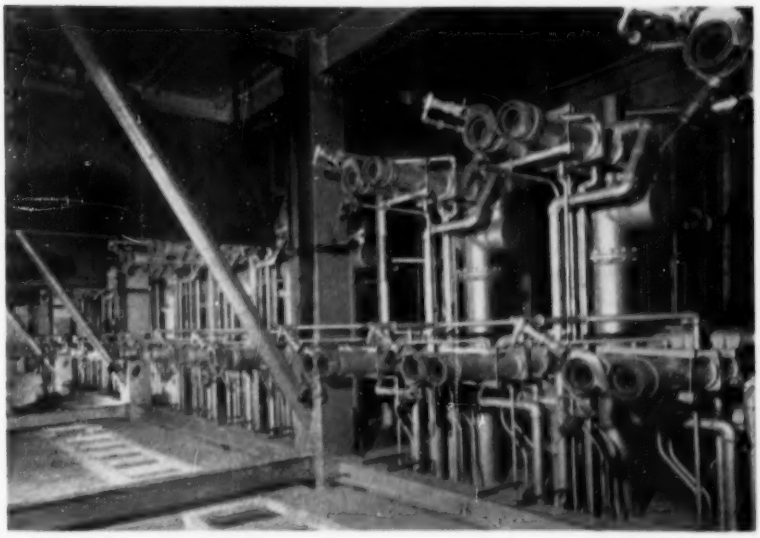
Fuel supplied by the gas industry is at work all over the United States in military installations and vital industrial applications affecting the nation's offense and defense. Here is how the National Advisory Committee for Aeronautics uses natural gas at its Lewis Laboratories.

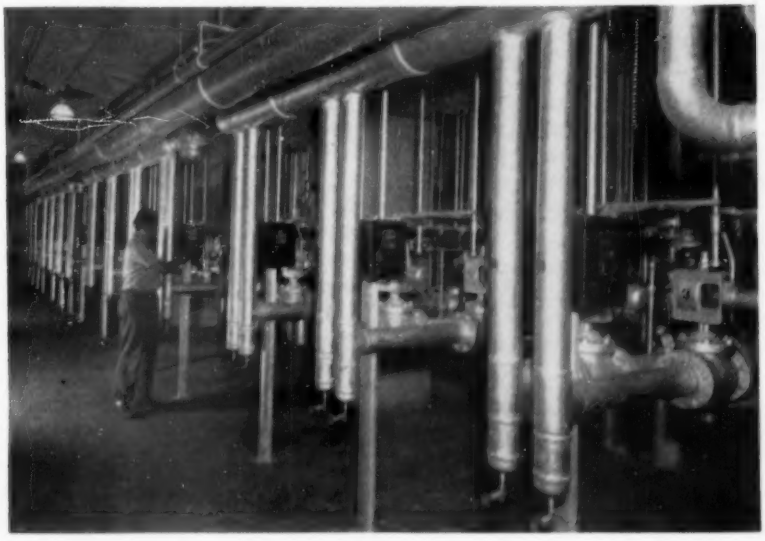
GAS utilization report



In this room, air is heated prior to passing over beds of activated alumina (in another, adjoining room) to remove moisture during the reactivation cycle.



These 32 natural gas-fired burners are used to heat the air used to dry the absorber beds. Each burner produces 8 million Btu/hr.



Control side of the burners. Natural gas consumption is 256 Mcf/hr in this bank of burners.

high altitudes is dry air. Large volumes of natural gas are used to provide heat for the air dryers. The air dryer, actually a building 117 ft by 84 ft by 82 ft (high), is charged with 32-in. deep beds of activated alumina (Al_2O_3), a compound not unfamiliar to dehydration operations in the gas industry. The 1890-ton charge of alumina absorbs water at the rate of one ton per minute as 1.5 MMcf of air per minute is drawn through the dryer.

The alumina becomes saturated after it has extracted about 15,000 gal. of water from the throughput air. Then, a reactivation cycle is started to dry the absorber beds. During this phase, dampers are operated to lead indrawn air through a room where 32 6-in. North American burners are brought into operation.

The burners warm the air which is passed over the activated alumina in the saturated condition. The warm air absorbs the water from the alumina and carries it in vapor form out to the atmosphere through a vent in the roof.

The bank of 32 burners is fired with natural gas at the rate of 256 Mcf/hr or 8 Mcf/hr/burner. Their output is 256 million Btu/hr. The building is specially designed to take the expansion and contraction produced by rapid temperature variation. Only the center of its 25 steel columns is stationary; the walls are designed to move as much as 1.5 in.

It takes four hours to heat the bed temperature to 350° F. The alumina is then considered unsaturated. The eight large blowers, powered by 200-hp motors, are then reversed and dampers arranged to pass air over the absorption beds until the absorbing material is cool. This takes another four hours.

Lewis Laboratory uses natural gas for other phases of research. For instance, five large gas heaters (still another is in the planning stage) provide heat to warm air for an equal number of tanks used to simulate the heat encountered in supersonic flight. Heated air is produced in front of the engine in supersonic flight by the engine's forward motion. The tanks are used to simulate supersonic conditions affecting the engine only; the tunnel is used to duplicate an environment for the whole engine installation.

Total load at NACA's Lewis facility can be as great as 450 Mcf per hour. To expedite delivery of this volume of fuel, a working arrangement with the supplier—East Ohio Gas Co.—has been developed. When drying operations are scheduled, Lewis Laboratory notifies East Ohio's gas dispatcher about one hour in advance. They give the approximate load on and drop off times. The gas company then plans to deliver the gas so that the large volume sent out does not cause excessive pressure drop in its distribution system near the laboratory.

Lewis Laboratory's projects contributed materially to many of the performance gains of military aircraft in the current "century series," i.e., the F-102 and F-104. It is another example of how industrial utilization of natural gas has indirectly aided the advancement of national security and safety. ■

TABLE I. DESIGN DATA FOR LARGE ATMOSPHERIC AIR DRYERS.

I. General design features:	10'x10'
Mass flow rate—lb/sec.	1838
Inlet conditions (Dry bulb temp. °F.	85
(Wet bulb temp. °F.	73
(Dew point °F.	67
(% relative humidity	58
Grains water to be removed/lb dry air	103
Mass of alumina	3,780,000
Absorption per pound, per cent	3.33
Total lb water absorption capacity	125,900
Design operating time	77.8
Square feet bed area	25,200
Bed thickness, inches	32
Face velocity, feet per minute	60
Pressure drop through beds, inches of water	4.0
Pressure drop through building, inches of water	6.0
II. Reactivation equipment:	
A. Heaters	
Number	32
Btu/burner/hr	8,000,000
Total Btu/hr	256,000,000
Combustion air pressure, oz.	12
" " blower hp	200
Fuel/air ratio—approx.	14:1
B. Coolers	10'x10'
Number of units	36
Square feet face area—total	1080
Maximum water rate, gpm	9330
Water pressure drop, feet head	60
Air pressure drop, inches water	1.6
Temperature rise water—max. °F.	65
Temperature drop air—max. °F.	250
C. Fans	
Number	8
hp/unit	200
Total hp	1600
Scfm flow forward (cooling)	835,000
Press. rise forward	6.7
Max. (no flow) press. rise, inches water	8.9
Scfm flow reverse (heating)	721,000
Press. rise reverse, inches water	5.0
Max. (no flow) press. rise	6.85

Announcing

NEW CAPACITIES

THERMAC SR-100

COMBINATION PRESSURE REGULATOR AND THERMO ELECTRIC PILOT

AGA Certified

THERMAC HM COMPANY

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24 years experience building gas controls.

Responsibility of leadership in the controls business demands constant research and progress for improvement in product performance and lower cost. This, we have achieved and proudly offer to appliance engineers.

Our engineers have built into the Thermac SR-100 a new ability to handle a broader range of furnaces and appliances. So marked is this increased capacity that now the SR-100 can be used where here-to-fore a more expensive control has been required. This increased capacity is not a mere "technical" increase of 5% or 10% but a great deal more, as will be observed when testing the new unit.

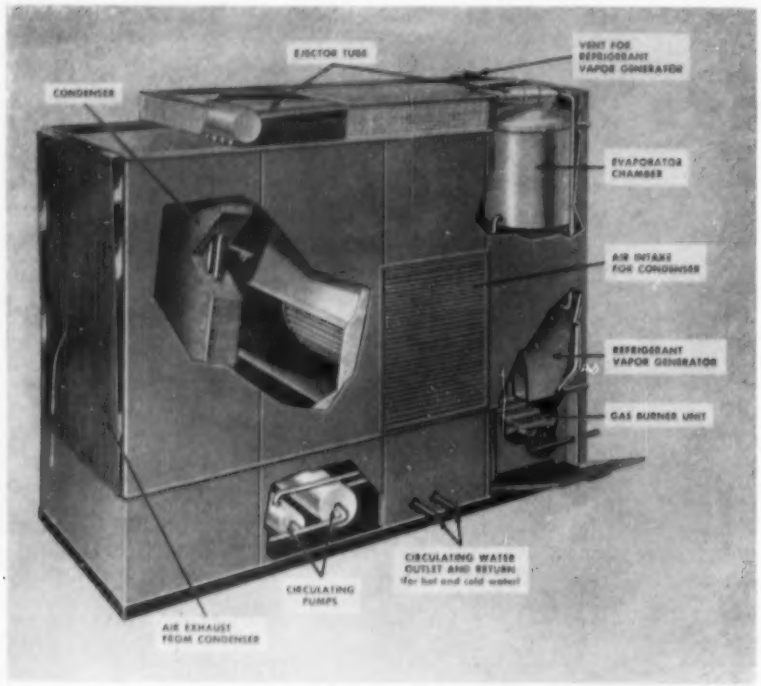
Carrying A.G.A. Certification and patent application, the unique method which we employ to increase flow capacities is now a part of all SR-100 controls at no extra cost.

You are invited to request samples of this new SR-100 for testing and comparison.

READY IN '58

Prototype of gas air conditioner unveiled for press

to a *Gas* reporter during a press conference held in the laboratories of The Peoples Gas Light & Coke Co., Chicago, on Sept. 27, at which time the prototype of a new gas-fired central air conditioning unit, currently under development, was shown in operation. The new unit, utilizing the jet principle of refrigeration, will not be marketed until 1958, according to Rheem officials, but will be subjected to severe field tests in all parts of the country during the coming year.



Cut-away drawing shows principles of new year-round air conditioning unit recently unveiled at special press showing in Chicago.

"A NEW 'year-round' air conditioner for homes, centrally operated by gas, which will provide heating, cooling, humidity control, filtration and circulation of air (as envisioned for the near future) will create a strong impact on the gas industry," is the considered opinion of Lyttleton Price Jr., director of research of Rheem Manufacturing Co.

This viewpoint was expressed

In discussing the potentials of the new Rheem unit, Mr. Price estimated that it would help reverse the trend of gas consumption by the public from a heavy load in cold weather and light load in warm months to a more even level throughout the year. Homes in the northern sector of the country would consume from 30 to 40 per cent more gas, and in the southern part of the country from 50 to 70 per cent more gas, in the warm summer months than presently.

Operation of the cooling system of the Rheem unit is expected to require about 15 to 20 gal. of water per hr, depending upon the climate. This figure, according to the Rheem engineers, is in line with the permissible consumption of water in practically all sections of the country. Pricewise, the unit will be competitive with existing models of electrically operated central air conditioning units in conjunction with heating plants. The projected 3-ton Rheem model, adequate for most homes, is expected to carry a price tag in the neighborhood of $1000. A 5-ton model for larger homes, at a comparable higher price, is contemplated. Operation costs of the gas unit are also expected to be competitive with electrically operated models, and the efficiency of the gas unit will be much higher, in the opinion of the Rheem engineers.

Several other manufacturers of gas appliances are currently experimenting with and developing air conditioners, using various different principles of gas operation, Mr. Price declared. This, he believes, is a healthy and encouraging sign, since it indicates that the whole gas industry is tackling the problem of leveling the consumption of gas throughout the year. Where one company alone could not convert public thinking away from electric to gas air conditioners, the combined promotions and efforts of a group of manufacturers could well succeed; to the ultimate benefit of the entire gas industry.

The refrigeration principle used by the new Rheem gas-fired unit should not be confused with jet engines for aircraft. In the Rheem air conditioning unit a small jet discharges refrigerant vapor at supersonic speed inside a contoured ejector tube to produce a temperature drop of several hundred degrees Farenheit in the vapor. The high speed of this discharge entrains vapor of refrigerant maintained in an evaporator chamber connecting with the ejec-

tor tube. Evaporation takes place in the chamber and produces rapid cooling. This refrigerating effect is used to cool water circulated through copper pipe coils in the evaporator chamber.

Low temperature is maintained by relieving the ejector tube of pressures that would be expected to build up due to the jet action. The pressure reduction is made by condensing the vapor in a unique air-film condenser that has been in use by Rheem for the past three years.

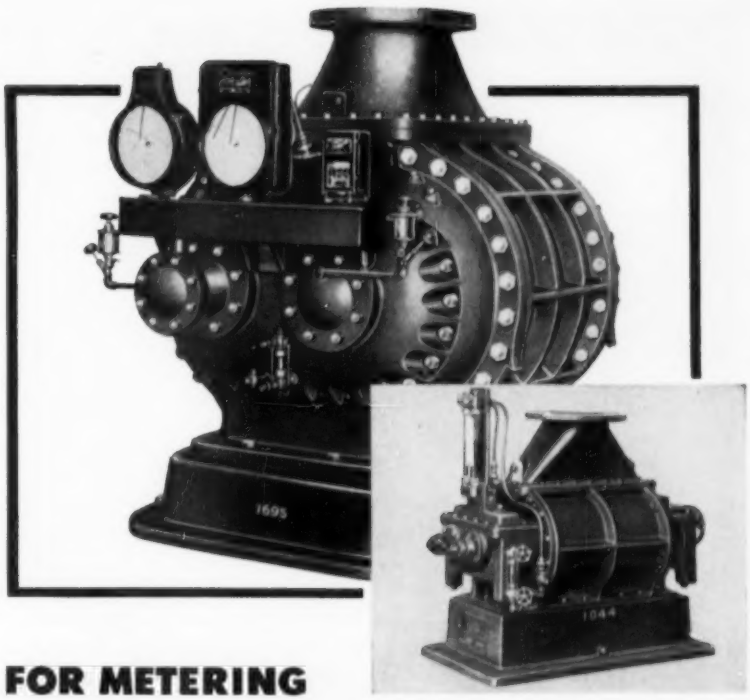
When controls are set to actuate the heating cycle, the vapor-condensing phase of the system is halted. Then, jet discharge is diverted into the evaporator chamber and heats water circulating in the copper coil before the water passes to a finned coil in a blower cabinet or to a water heating system—depending on the type of heating system employed in the home.

The heating or cooling liquid-and-vapor system is a completely sealed operation. Some of the liquid is pumped into a refrigerant vapor generator where a controlled gas flame vaporizes the liquid as needed to supply vapor pressure for the jet operation. Another portion of the liquid feeds into the evaporator chamber.

Both operations, and the regulation of the gas flame, are controlled by simplified, positive controls. The unit has been engineered to be a practical, safe appliance for home use. Controls are self-actuating—automatic—with at least one standby control.

The air conditioning unit has been designed for installation outside the home, adjacent to one exterior wall; however, with a vent and exhaust added (the latter for the condenser air stream) it will be fully satisfactory for inside the home installation.

The Rheem unit's cabinet is 4 ft long; 2 ft wide, and 4 ft high. The owner can change it from the one cycle to another (cooling to heating or vice versa) by a simple change in the thermostat's setting. A name for the new year-round air conditioning appliance has not been selected. ■



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Centrifugal and Rotary Positive Blowers, Gas Pumps and Exhausters

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Packed into every Roots-Connersville Positive Displacement Gas Meter are important values which mean *"plur-ability."* Summed up, they give you accuracy unmatched by any other type—that endures over many years of use. Maintenance is practically unknown, with no vanes, valves, or small parts. Compactness saves space and foundation cost. Capacities, pressures and overload ability fit your most exacting needs. Wherever you need to measure gas from 5,000 cfh to a million, you can trust the staying qualities of R-C Positive Displacement Meters. Ask for specification details in Bulletin M-152.

ROOTS-CONNERSVILLE BLOWER

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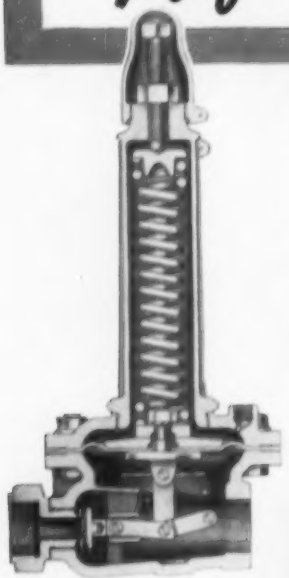
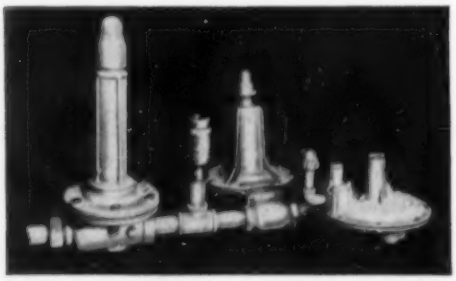
356 Oregon Ave., Connersville, Indiana. In Canada—629 Adelaide St. W., Toronto, Ont.

IN THE HIGH PRESSURE FIELD
THERE IS SAFETY
IN *Reynolds* ...



Accurate, Safe Control

of tremendous pressures is an ever present problem in the gas field. Reynolds field Regulator illustrated at left is one of the many high pressure regulators built by Reynolds. It is thoroughly tested and proved in service. It handles up to 1,000 pounds safely reducing some to pounds. For more than fifty-five years Reynolds has designed and built gas regulators. Safety, accurate performance, years of service—these are some of the built-in factors responsible for Reynolds enviable position in the Gas Control Field.



Reynolds Gas Regulator Co.
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GAS CONTROL SINCE 1892

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- Gas Stoves
- Gas Water Heaters
- Wherever Dissimilar Metals are Joined

WRITE FOR TECHNICAL DATA, SAMPLES AND PRICES

Stop ELECTROLYSIS DAMAGE

A necessity for any gas installation where electrolysis damage is a possibility. Made from virtually-indestructable red PLASKON nylon. Available in sizes from ⅛" x ⅜" to 1½" x 1¼" inclusive. Now used by many original equipment manufacturers. Protect your installations against electrolysis. Make any fitting a dielectric fitting for only a few cents.

Sold by leading plumbing and heating supply wholesalers everywhere.

MAY COMPANY • Galesburg, Ill.

GAS calendar

November

9 AGA Midwest Personnel Conference—Broadmoor Hotel, Colorado Springs.

12-15 American Petroleum Institute—Conrad Hilton Hotel, Chicago.

14 AGA Industrial & Commercial Gas Section Commercial Gas Breakfast—Hotel St. Moritz, New York.

25-30 American Society of Mechanical Engineers—Statler Hotel, New York.

26-27 SGA Advisory Council and Management Conference—Point Clear, Ala.

December

Rocky Mountain Gas Association Annual Meeting—Denver.

1957

January

Pennsylvania Natural Gas Men's Association Annual Meeting—Wm. Penn Hotel, Pittsburgh.

18 Oklahoma Utilities Association Accounting Section (Place not set yet).

18 SGA Employee Relations Roundtable Conference—Statler-Hilton Hotel, Dallas.

23 NEGA Operating Division—Hotel Statler, Boston.

25 SGA Accident Prevention Roundtable Conference—Tutwiler Hotel, Birmingham, Ala.

25 Pennsylvania Gas Association Mid-winter Sales Conference—Benjamin Franklin Hotel, Philadelphia.

31 NEGA Accounting Division—Hotel Statler, Boston.

February

3- 5 27th Annual Mid-Winter Conference, Public Utility Buyers Group, National Association of Purchasing Agents—Brown Hotel, Louisville, Ky.

4- 6 AGA Home Service Workshop—King Edward Sheraton Hotel, Toronto, Ont., Canada.

13-15 Eighth Annual Tulsa Corrosion Short Course for Pipeliners—Mayo Hotel, Tulsa.

21-22 SGA Accounting Management Roundtable Conference—Roosevelt Hotel, New Orleans.

21-22 SGA Sales Executives' Conference—Roosevelt Hotel, New Orleans.

March

7- 8 SGA Distribution Management Roundtable Conference—Roosevelt Hotel, New Orleans.

11-15 National Association of Corrosion Engineers—Kiel Auditorium, St. Louis, Mo.

21-22 New England Gas Association Annual Meeting—Hotel Statler, Boston.

25-27 Mid-West Gas Association — Hotel Nicollet, Minneapolis.
28-29 Oklahoma Utilities Association Annual Convention—Tulsa.

April

8-10 National Conference of Electric and Gas Utility Accountants—Sheraton-Park Hotel, Washington, D. C.
8-10 GAMA Annual Meeting—The Greenbrier, White Sulphur Springs, W. Va.
8-11 AGA Distribution, Motor Vehicles and Corrosion Conference —Rice Hotel, Houston.
14-17 Texas Independent Producers & Royalty Owners Association—Galvez & Buccaneer Hotels, Galveston.
16-18 Southwestern Gas Measurement Short Course—College of Engineering, University of Oklahoma, Norman.
16-18 AGA Sales Conference on Industrial and Commercial Gas—Jung Hotel, New Orleans.
24-26 Natural Gasoline Association of America 36th Annual Convention Rice Hotel, Houston.
24-26 Indiana Gas Association—French Lick-Sheraton, French Lick, Ind.
29-May 1 Southern Gas Association Annual Convention — New Orleans.

May

Natural Gas & Petroleum Association of Canada—Hotel London, London, Ont., Canada.
6- 7 AGA Residential Gas Section Eastern Sales Conference—Hotel William Penn, Pittsburgh.
8-10 Joint AGA-PCGA Gas Supply, Transmission & Storage Conference—Mark Hopkins Hotel, San Francisco.
15-17 AGA General Management Section Conference — Jung Hotel, New Orleans.
20-22 AGA Mid-West Regional Gas Sales Conference — Edgewater Beach Hotel, Chicago.
20-22 AGA Chemical, Engineering and Manufactured Gas Production Conference — Balmoral Hotel, Miami Beach, Fla.
21-23 Pennsylvania Gas Association Annual Meeting—Pocono Manor Inn, Pocono Manor, Pa.

June

23-27 Canadian Gas Association—Jasper Park Lodge, Jasper, Alberta, Canada.
24-25 Michigan Gas Association — Grand Hotel, Mackinac Island, Mich.

September

3- 4 Pacific Coast Gas Association Annual Convention—San Francisco.
6 New Jersey Gas Association Annual Meeting—Spring Lake, N. J.
9-13 AGA Industrial Gas School—Hotel William Penn, Pittsburgh.

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On transmission lines between cities, and on distribution and service lines in town, Parsons 150 wheel-type Trenchliner combines big production capacity with precision grading accuracy. It digs 16 to 26 inches wide, at depths to 5¾ feet. 30 digging feeds up to 25 feet per minute assure maximum trench production at every width, depth, and in all soil conditions.

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Hinged crumber sweeps trench bottom clean, ready for pipe. Shiftable reversible belt conveyor, 24 inches wide, places the spoil bank on either side of the trench.

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Gas Digest

A digest of what's new in products and trade literature compiled by the editors of GAS as a reader service.

New Products and Trade Literature

For more data on any of these items use the Readers' Service Card on pages 71, 72

1. Slip-on end caps

Slip-over and roll-on end caps—made of neoprene—which effectively seal out air, moisture, corrosive fumes, and dust are manufactured by Protokap Inc.

By adding a small amount of dehydrating agent before slipping on the caps, the inside of alloy tube stock is protected from corrosion, according to the manufacturer. Suitable also for threaded pipe, the new caps reportedly retard drying of thread dope and keep the threads free of sand and grit.

Two types are currently available: a lightweight, roll-on cap for pipe 2 to 10 in. in diameter, and a heavier, slip-on cap for 2- to 20-in. piping. The standard slip-on covers have a wall thickness of about $\frac{1}{8}$ in.

Protokap Inc.

2. Mobile radio unit

Long life, easy serviceability, and high quality performance are claimed by Allen B. DuMont Laboratories for its new mobile radio communications unit.

The latest in DuMont's line of 2-way mobile radio systems is the MCA-110-B, a vibrator-powered unit that offers 60 to 75 watts across its entire frequency band—25 mc to 54 mc. Designed for use with either 6- or 12-v systems, the new unit can be employed in any year or make vehicle with battery-type electrical system.

The MCA-110-B features deviation-compensated squelch, a design that allows all tuning adjustments from the top of the chassis, and a simple flick-of-the-switch selector for one-to-four channel operation.

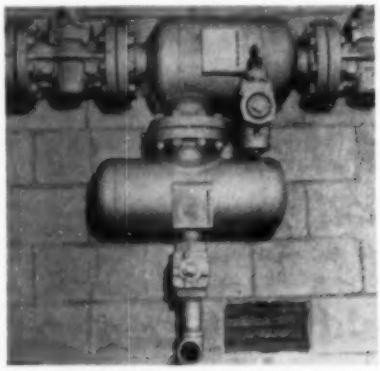
Allen B. Du Mont Laboratories

3. Hydraulic trencher

M & W Iron Works' Ditch-A-Line hydraulic trencher digs a 2- x 20-in. trench up to 400 ft/hr, depending on soil type. The entire mechanism is mounted on hydraulically driven crawler tracks. The self-tightening digging chain is also hydraulically driven and is designed to discharge debris without breaking the digging chain.

The Ditch-A-Line trencher can be driven up a plank ramp to the bed of the pick-up truck. It is driven by a 6-hp gasoline engine with a reduction gear and hydraulic drive.

M & W Iron Works Co.



4. Purifier

Anderson's new Hi-eF purifier for gas distribution and industrial services is reported to remove virtually 100 per cent of all dust and dirt picked up by natural gas in pipelines. It is effective during peak heating loads when higher velocities carry the greatest amounts of pipeline entrainment, as well as during low pressure periods.

The unit shown is handling from 100 to 125 Mcf/hr of gas at 200 to 275 psig. Basically, the purifier is made in three types: (1) low pressure, (2) 150 and 300 psig line purifiers, and (3) 600 psig line purifiers.

V. D. Anderson Co.

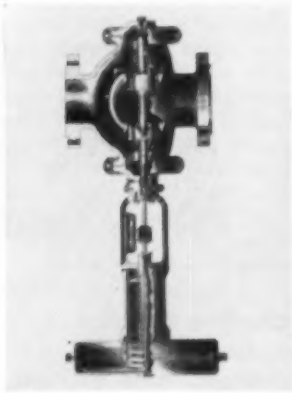
5. Two-way radio unit

Because of the widening use of Citizens Band Radio by commercial enterprises, General Electric has introduced a new 450-mc two-way radio unit which will be included as a standard item in the company's flexible and interchangeable Progress Line.

The new 450-mc will fit in a standard 14-in. Progress Line case, built for both truck and front-mounting. The feature of interchangeability with existing PL equipment is carried through even to interrupter vibrator power supplies, which are identical in 450-470 mc with those used in 25-50 mc and 148-174 mc.

Units may be switched easily between vehicles with 6- or 12-v dc systems. Base stations and mobile units are identical.

General Electric Co.



6. Diaphragm control valve

Black, Sivalls & Bryson has introduced an entirely new line of diaphragm control valves—the Super 70 series—which includes a new topworks, redesigned valve body, and an all-metal float ring seal.

The topworks features a new molded diaphragm for uniform thrust over full valve travel, pressed steel cases for maximum strength with minimum weight, and a precision-calibrated single spring. Redesigned parts of the valve body include streamlined flow contours, top and bottom guided inner valves, all-metal float ring seal, forged clamp ring, and bolted stuffing box with stainless steel followers.

Black, Sivalls & Bryson

7. Coal tar primer

A new priming solution developed especially for use with Tape-coat coal tar protective coatings has been announced by Tapecoat Co.

Known as TC Primecoat, the new product is designed to give users a primer that is compatible with the coal-tar-pitch base used in Tapecoat protective materials.

TC Primecoat is available in 1-gal. cans, packed 2 gal. to the carton. Application coverage is 400 sq ft per gal., according to the manufacturer.

Tapecoat Co.

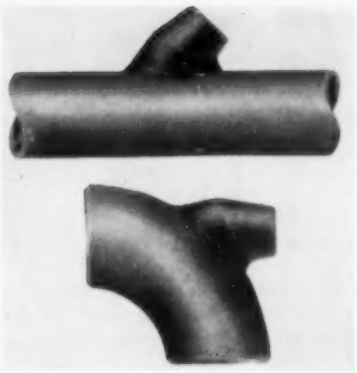
8. Hydraulic crane

McCabe-Powers has added a truck-mounted hydraulic crane to its line of utility bodies and equipment.

Called Load-Master, the unit has a rated capacity of 4000 lb. It is designed for installation on any chassis having a cab-to-axle dimension of at least 84 in., and requires only 20 in. of mounting space behind the truck cab.

All movement is hydraulically actuated. Power is derived from a hydraulic pump, driven by a power takeoff installed on the truck transmission. All operations are controlled by one man, with levers which are normally installed on the crane superstructure to afford operator an unobstructed view of the boom at all times.

McCabe-Powers Auto Body Co.

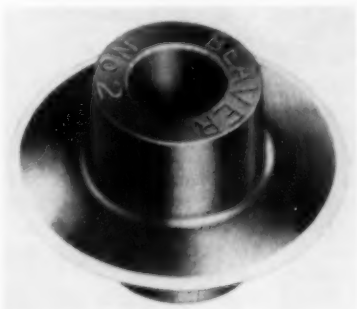


9. Pipe fitting

Bonney Forge has announced a branch welding pipe fitting for constructing angular branch connections with a full penetration weld.

Bonney Elbolets are used for making 45° connections for directional flow and instrument connections and for connections into elbows for instruments, drips, and hangar end support connections.

Bonney Forge



10. Cutter wheel

Black Magic is the name of the new honed edge cutter wheel produced by Beaver Pipe Tools Inc.

The new cutter wheel fits all standard Make No. 2 cutters and pipe machine wheel cutoffs. The edges are specially honed to give easier cuts, and the company claims the cutter is harder and more durable.

Beaver Pipe Tools Inc.

11. Combination heating units

Included in Temco's line is combination heating and air conditioning equipment for year-round home comfort.

Air-cooled air conditioning units are produced in three sizes: 2-, 3-, and 5-ton capacity. They are designed primarily for use with

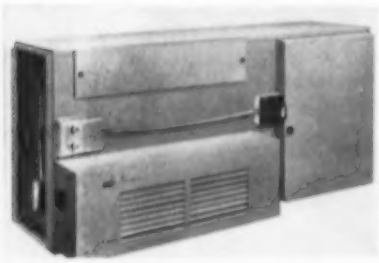
Temco's forced air furnaces. However, they can also be used with existing furnace installations, utilizing present duct work in most instances.

Adequate blower capacity is provided to handle air conditioning, which permits a package installation or addition of air conditioning at a later date.
Temco Inc.

12. Probe set

Engineers Tool Co.'s 36-72 high pressure probe set can be used for high pressure or low pressure lines. The short probe penetrates 36 in., then the long probe takes over and goes down 72 in. Reciprocating motion of weighted handle operates it. Impaction does all the work.

The M-Pact-O, for use with explosion test meters, comes equipped with spark-resistant points.
Engineers Tool Co.



13. Horizontal furnace

Belt-driven as well as direct-drive blowers will be available in a restyled and improved line of Coleman's horizontal gas-fired furnaces for 1957.

The new models will be readily adaptable to either conventional duct systems or Coleman's 3½-in. prefabricated Blend-Air system. The unit itself may be installed in the attic, under the floor in the crawl space, in an attached garage, or suspended from the ceiling.

Designed for maximum flexibility of installation and service, the line's controls, burners, and vents can be mounted on either side of the furnace, permitting installation as either a right- or left-hand unit.
Coleman Co.

14. Communication system

Bendix Radio's new low power two-way FM radio communication system is designed specifically for low-power limited range communication applications as either a base or mobile station.

Known as the Bendix Bantam, the new system operates in the 144-174-mc frequency range. It operates from a wide variety of power sources—6-, 12-, 24-, 32-v dc, or 117-v ac without modification, adjustment, or external converters. Choice of input voltage is accomplished by a front-panel selector switch, providing complete interchangeability between base and mobile applications.
Bendix Radio Division

TRADE LITERATURE

15. Pump trouble booklet

Worthington Corp. has released a new booklet to help locate and correct common ailments of rotary, centrifugal, and steam pumps. Cartoon sequence pictures give a full description of pump troubles—from failure to deliver water to the loss of capacity after starting.
Worthington Corp.

16. Control chart

A chart listing the most suitable outdoor controls for use with different types of heating systems under varying conditions and requirements has been prepared by Automatic Devices Co. In addition to the chart, Bulletin N-756 presents guide specifications prepared in outline form.
Automatic Devices Co. Inc.

17. System bulletins

Two new pieces of literature have been published by Consolidated Electrodynamics Corp. describing operations of the company and its divisions. One, titled "Consolidated Systems Divisions," discusses instrumentation for industrial control, chemical analysis, dynamic and static testing, and high-speed electronic data processing. The other, titled "Your Next Move For Profit and Progress," discusses the operations of CEC, Consolidated Vacuum Division, and the Electro-Data Corp.
Consolidated Electrodynamics

18. Meter bulletin

More than 100 measuring, transmitting, receiving, recording, and indicating instruments and control components for power and process applications are described in a new eight-page bulletin from Bailey Meter. Bulletin G15-1 includes detailed literature reference for each product.
Bailey Meter Co.

19. Valve circular

A new four-page, three-color circular details two pressure classes of Lunkenheimer LQ600 bronze globe valves. The circular describes the original Lunkenheimer Fig. LQ600-150 valve and the new Fig. LQ600-200 valve. Both valves are manufactured in eight different sizes—from ¼- to 2-in. diameters.
Lunkenheimer Co.

20. Backhoe bulletin

Bulletin TTS-121 from American Tractor Corp. illustrates special features of the new TerraTrac hydraulic backhoe, with detailed operational drawings. The six-page, three-color publication also presents complete specifications for both backhoe and TerraTrac crawler tractors on which it can be mounted.
American Tractor Corp.

21. Chemical catalog

Seventy-seven commercially available Sharples brand synthetic organic chemicals are listed in a new 12-page brochure from Pennsalt Chemicals. Included are formulas, product descriptions, and suggested uses. In addition, the brochure contains detailed information on 22 semi-commercial and 17 experimental compounds, samples of which are available in limited quantities.
Pennsalt Chemicals

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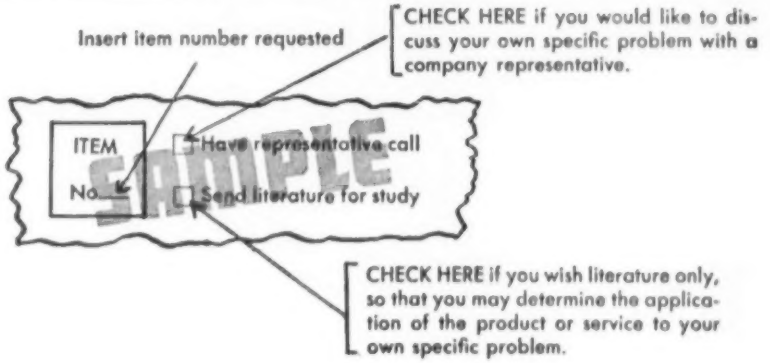
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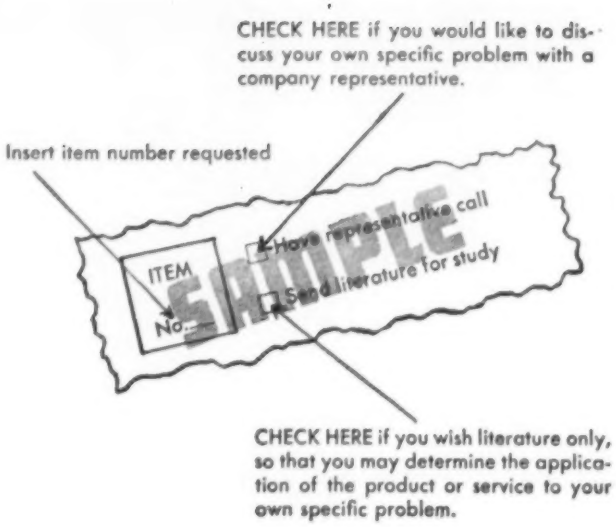
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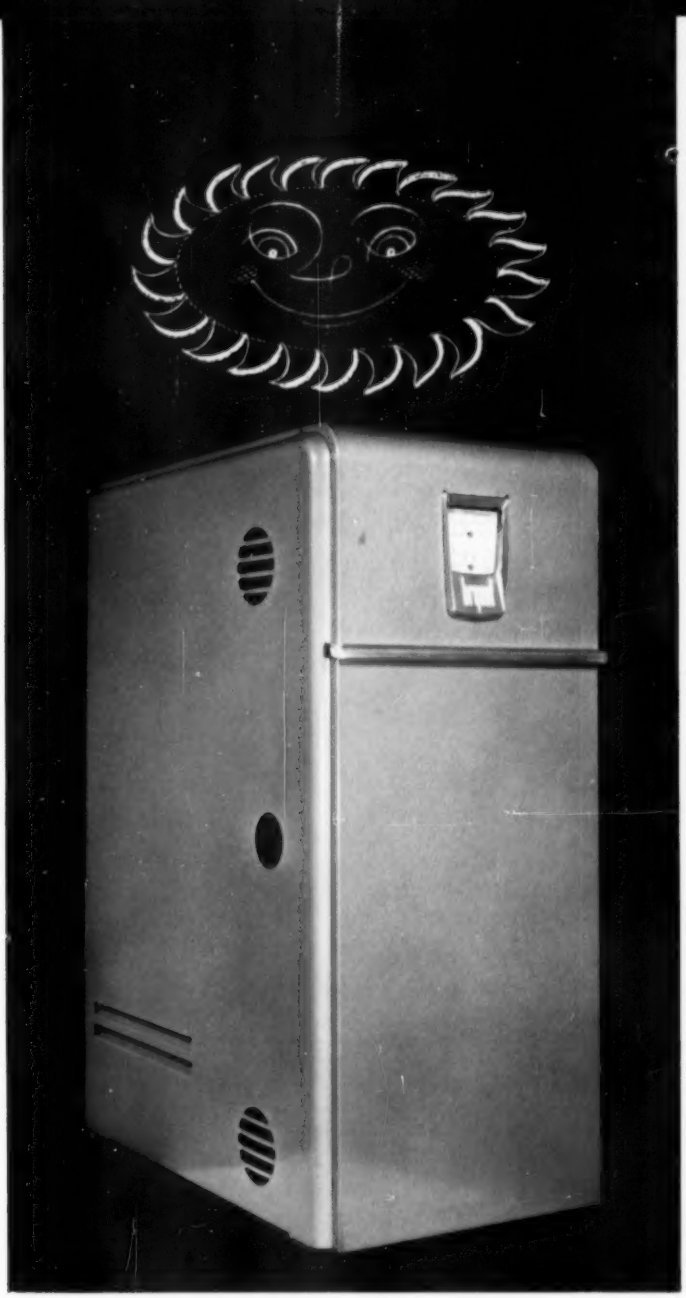

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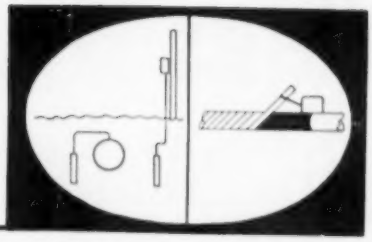

By GUY CORFIELD

Tapes for underground pipe protection

For the past several years there has been considerable interest in the use of tapes for underground pipe protection, as an alternative to the more conventional hot-applied bituminous enamels and greases.

There are obvious advantages to the use of tapes if they can be applied successfully without the necessity of employing heating equipment. It is also obvious that they have to be made of water impervious, damage-resistant and long-life material; that they must include a waterproof and permanent adhesive for attachment to the pipe and sealing of the lap joints; and that they must be applied smoothly and tightly, which is a rather difficult operation when covering welds, couplings, pipe fittings and other irregular shapes. Numerous applications and tests have been made, some on pipe sections of operating length and scope and others on a limited trial basis, and a variety of results and experiences have been obtained.

Indications are that tapes can be used successfully if applied with care, and economically particularly where the application advantages offset the somewhat high material costs. Long-term life cannot be predicted with certainty as the plastics are relatively new materials, but there is good reason to believe that their properties will be retained in underground service.

A recent installation has been reported by Marshall E. Parker, consulting corrosion engineer, Houston, where polyethylene tape was applied to a 12-mile section of 8-in. welded steel pipe in the Seadrift Pipe Line System in the Texas coastal plain area. A single wrap of 8-mil tape was used, with half-inch overlap, and an adhesive mass of 4 mils. It was applied directly to the machine-cleaned pipe, and covered with an unbonded outer wrap of coal tar-saturated asbestos felt. The section was isolated with insulating joints, and when cathodic protective current was imposed it was found that a total of only 74 milliamperes, or 6.16 milliamperes average per mile, were required to bring its potential within 888 to 966 millivolts referred to a copper-sulfate electrode. This rather successful wrapping job was done with a hand-operated machine, and it is estimated that with currently available power equipment the job could be done at a total applied cost comparable to that of more conventional systems.

An interesting series of tests are described by Henry M. Clayton, of the Light, Gas and Water Division of Memphis, Tenn., in a paper entitled "Testing Wrappings on Cathodically Protected Submerged Pipe and Fittings," published in the September 1956 issue of *Corrosion*. Mr. Clayton was concerned with protection of welded and fitted joints in service pipe, which were difficult to coat in the field with hot enamel. He decided to test various "cold" coatings, including tapes, by applying them to a standard pipe combination consisting of two pieces of 1-in. pipe, one 27 in. long and the other 14 in. long joined by an elbow and capped at the other two ends, so that the applied coating covered the cap and elbow as well as the short distances of straight pipe. The assemblies were immersed in water with the 27-in. arm submerged horizontally and the 14-in. arm vertical and partially protruding out of the water to serve as an electrical connection. The water was adjusted with salt to 2000 ohms per cubic centimeter resistivity. Carbon anodes were placed adjacent so that voltage could be applied between them and the coated pipe to, as the author states, "show the resistance of the tape covering to the flow of current or, as finally determined, to show the current flow resulting from a given voltage." Voltages were initially adjusted to bring the pipe samples to 0.85 volts (to Cu-$CuSO_4$ electrode in the surrounding water), and increased through an 8-week period to 2.50 volts. Polyvinyl chloride and polyethylene tapes were tested, at both 10-mil and 20-mil thicknesses. Mr. Clayton's conclusions were:

1. Of the two principal tape materials tested, it was assumed that dry polyvinyl chloride and polythylene tapes had a high enough resistance to the flow of current so that the current would be so slight in either tape it would not result in an appreciable difference. After wetting, however, it could not be determined whether water adsorption by the tape material or water creeping under the tapes resulted in an increase of current flow. Observation indicates that current flow increased principally because water crept under the tape.

2. The effectiveness of the adhesive used was probably one of the major factors in determining the current limiting ability of the

(*Continued on page* 76)

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(*Continued from page 75*)

tape. Without an effective adhesive, the tape could creep and allow the passage of water and current between the overlapped layers.

3. Even a good adhesive, however, cannot compete with the pull of a very elastic tape at the end of the windings unless very great care be used in applying it without stretch. Even though the last few turns are placed without tension, the tape's natural elasticity will cause it to creep until movement takes place on the end wrap. When such a tape was used for short wrappings and over fittings as in the test described, this slippage was found to be serious.

4. Another factor that was found to be very important was the memory of the tape, that is, the tape's desire to return to its original flat and straight condition. The poorer the memory the better the results obtained especially when wound around irregular objects such as pipe fittings. This factor is not believed to be of as much importance, however, when tapes are applied on longer runs of straight pipe only.

5. Poor results were obtained with all 20-mil tapes. The stiffness due to extra thickness evidently resulted in the inability of such a tape to accommodate itself to a 1-in. pipe and fittings.

Tank lines for corrosion proofing

An interesting way of corrosion-proofing a tank, or repairing one that has been damaged by corrosion, has been developed by the Flexi-Liner Co., Arcadia, Calif. This company provides a flexible plastic liner, of material consistent with the liquid which the tank is to contain.

The original tank shell merely supports the plastic liner, without bond, so that careful cleaning of a repaired tank is not necessary. The liner materials so far developed are stated to be not suitable for sustained temperatures above 160°F., although 200°F. can be withstood for short periods.

GAS people

JOHN C. BOLENDER has been promoted from vice president and general manager to the newly created position of vice president-administration of Peoples Gas System, North Miami, Fla. At the same time, the company appointed DAVID M. ECKMAN, former vice president and general superintendent of the Battle Creek (Mich.) Gas Co., to the new post of vice president-operations. IVAN BALL, comptroller, was elected vice president and comptroller.

SHERMAN CHICKERING has been elected a director and member of the executive committee of San Diego (Calif.) Gas & Electric Co., succeeding his father ALLEN L. CHICKERING, who has resigned as a director but will continue as vice president.

Southern California Gas Co., Los Angeles, has named CARL W. SHUPP to succeed E. F. HAWKESWORTH as southwest division manager. Mr. Hawkesworth was recently named manager of special services. It is also announced that GEORG BABBE, staff engineer in distribution, will assume Mr. Shupp's former duties as superintendent of distribution in the central division.

SAM K. WILSON has been appointed advertising manager of the gas range division of the Geo. D. Roper Corp., Rockford, Ill.

WILLIAM F. BROWN, safety director of Consolidated Edison Co. of New York has received the Arthur Williams Memorial Award from the American Museum of Safety. Mr. Brown, safety director at Con Edison since 1944, received the award in recognition of "inspiring leadership in local, state, and national safety achievement."

HUGH C. WARD, vice president of First National Bank of Boston, is a newly elected director of Baltimore (Md.) Gas & Electric Co.

DAVE COWDEN, purchasing agent for Arkansas Louisiana Gas Co., Shreveport, since 1941, has resigned to accept a position as special assistant to the purchasing agent of Cities Service Oil Co., Bartlesville, Okla. SAM H. BROWN,

Clean Oil

SAVES YOU MONEY!

HILCO

OIL MAINTENANCE EQUIPMENT

. . Keeps your Oil and Equipment Clean

FILTER

Furnished in capacities from 0.1 to 750 gpm. Various cartridges available for mineral and inhibited detergent oils.

HILCO FILTER CARTRIDGES

The result of much research in the field of lubricating, fuel and industrial oil filtration, the new patented HILCO Filter Cartridges meet the need for tremendous filtering area, low pressure drop and high dirt storage capacity. Above: Fig. 1 is a new cartridge; Fig. 2 is a used cartridge (note that pockets are completely filled and the outer surface covered with solids); Fig. 3 shows the flow of oil, the dark area represents dirty oil passing into the pockets while filtered oil (white area) passes into "S" shaped section.

HILCO Purification Means *Complete* Oil Purification . . .

You get absolute removal of sludge, acids, carbon, water and fuel dilution with a properly selected HILCO. Clean oil saves you money. Expensive maintenance is reduced, equipment shut-downs practically eliminated, lost man hours and cuts in production become a thing of the past. HILCO continuous, all electric, automatic purification keeps your oil clean and in top condition at all times. You receive the full capacity and economy of your equipment.

HILCO offers a wide range of oil purification units to meet every oil conditioning problem. HILCO units are manufactured in both stationary and portable models. Write us about your purification needs . . . recommendations are given with no obligation. Let HILCO put its 25 years of experience in oil purification to work for you.

THERE'S A HILCO FOR EVERY LUBRICATION AND FUEL OIL FILTERING PROBLEM

Oil Reclaimer

Purifier Re-Refiner

High Capacity Reclaimer

WRITE TODAY FOR THE NEW HILCO CATALOG

• Recommendations at no obligation!!

THE HILLIARD Corporation

165 W. FOURTH ST. • ELMIRA, NEW YORK

IN CANADA: Upton-Bradeen-James Ltd., 890 Yonge St., Toronto; 3464 Park Ave., Montreal

people • *Continued*

manager of payrolls for the gas company, succeeds Mr. Cowden as purchasing agent.

ROBERT L. GAGE has been named manager of Michigan Consolidated Gas Co.'s industry development division. Mr. Gage has been manager of the Ann Arbor (Mich.) Chamber of Commerce. From his headquarters in Detroit, Mr. Gage will head the company's division which works with the more than 100 communities served by Michigan Consolidated which are seeking new or expanded industrial development.

Robert Gage
Mich Con

John Kott Jr.
J. H. Holan Corp.

R. K. VonDerLohe
SoCounties

Richard Hempel
Dollinger

H. V. ROBERTS has been named assistant supervisor of field gas measurement for Manufacturer Light & Heat Co., Pittsburgh. He is a 32-year veteran with the company.

RICHARD P. HEMPEL is now manager of liquid filter sales for the Dollinger Corp., Rochester, N. Y. Mr. Hempel was formerly an industrial engineer at the Eastman Kodak Co.

DONALD N. MCCORD has been appointed construction manager of Stone & Webster Engineering Corp., New York. He has been with the organization since 1941.

Mueller Co., Decatur, Ill., has appointed W. R. LEOPOLD JR. as engineering division manager, a new position. Mr. Leopold comes to Mueller from the Lycoming division of Avco Manufacturing Corp.

DAVID A. ELLIOTT is the newly appointed Electro-Span applications engineer for the eastern area, according to the Pacific division of Bendix Aviation Corp. He will headquarter in Devon, Pa.

JOHN KOTT JR. has been appointed sales manager for J. H. Holan Corp., Cleveland. The former assistant sales manager will supervise sales of utility bodies and associated power equipment.

Coleman Co. Inc., Wichita, has named ROBERT H. LOWE advertising and sales promotion manager, succeeding JULIAN F. WARREN, who has resigned. Mr. Lowe joined Coleman in January 1955 as promotion manager of the utilities operation department.

ROBERT K. VON DER LOHE has been appointed manager, commercial and industrial sales by Southern Counties Gas Co., Los Angeles, succeeding the late Don C. Ellswood. Mr. Von Der Lohe has served

E. R. P. CATHODIC PROTECTION . . .
individually designed for each application

An effective installation that operates at the lowest cost per year requires experienced engineering evaluation of site and environmental conditions. The Electro Rust-Proofing Engineering Division makes available to you the cumulative experience gained in designing more than 10,000 cathodic protection systems.

Electro Rust-Proofing can furnish any one, or all, of the following services to help you provide proper cathodic protection for each of your jobs:

- Corrosion surveys and recommendations
- Design based on engineering experience
- Cathodic protection equipment and installation
- Service to assure proper operating results

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ELECTRO RUST-PROOFING CORP.
A SUBSIDIARY OF WALLACE & TIERNAN INC.
30 MAIN STREET, BELLEVILLE 9, NEW JERSEY
CABLE: ELECTRO, NEWARK, N. J.

E-35R

as staff representative, industrial sales with the company since 1953.

OTT HAMMER, formerly president of the Security Engineering division, has been elevated to a vice presidency of Dresser Industries Inc. CARRA L. LANE succeeds him as president of Security.

J. W. TOMLINSON is the newly appointed vice president and chief engineer of Northern Ontario Natural Gas Co. He has been manager of industrial sales for the company. Prior to that he has been assistant sales manager of Trans-Canada Pipe Lines.

Deaths

L. C. ROBERTS, 56, advertising director of the Lone Star Gas Co. died recently at a Dallas hospital following a lengthy illness. He joined Lone Star's advertising department in 1933 and in 1942 became advertising supervisor, rising to director in 1951. At the time of his death, Mr. Roberts was a member of the advertising committee of the AGA, chairman of the air conditioning committee of the association, and a member of the board of the Public Utilities Advertising Association.

STUART M. CROCKER, 58, chairman of the board and chief executive officer of the Columbia Gas System Inc., New York, died in September after a three-month illness. Mr. Crocker joined Columbia in 1943 as president and chief executive officer. In 13 years under his direction the company has tripled in size. His career before joining Columbia was with Radio Corp. of America and General Electric Co.

DON C. ELLSWOOD, 49, manager of commercial and industrial sales of Southern Counties Gas Co., Los Angeles, died recently. Mr. Ellswood joined SoCounties in 1935 and was appointed utilization engineer for the company in 1939 and named to his present position in 1946.

MARTIN L. SPECK, retired assistant secretary and treasurer of the Scranton (Pa.)-Spring Brook Water Service Co., died recently after a long illness. Mr. Speck, who was affiliated with the gas division of the utility for more than 55 years before he retired 10 years ago, began his career with the firm in 1894.

The man in the picture isn't hanging out the family wash.

As a matter of fact, the family wash is hanging him.

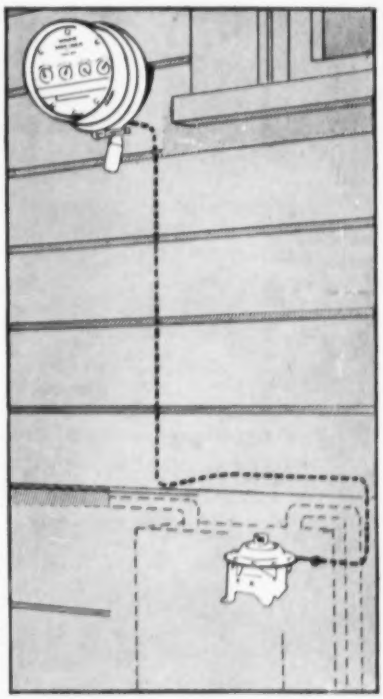
And it isn't even his family. The man in the picture is a gas meter reader. His job is to go down into a lot of strange basements and find out how much gas the customers have been using.

In doing this, he frequently runs into some uncomfortable situations. For instance, we know of a gas meter reader who went down into the basement of a house in 1942 and was never heard from again.

Naturally, it put his company in an embarrassing situation — they didn't know how much to charge for the amount of gas used.

Now this sort of thing *can* be avoided. You can install Sangamo Gas Telemeters on your present tin meters. The Telemeter brings the gas meter reading *outside* the premises. And the nice thing about a Telemeter is that no one who ever tried reading one has ever disappeared.

We wrote everything down we thought you'd like to know about Telemeters and had it published under the title, "Outdoor meter reading is here . . ." or Bulletin 802. We've reserved a copy for you, so write for it today.



it's easier to get the reading ON THE OUTSIDE!

SANGAMO ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

GAS news

First natural gas line planned for Vermont

Vermont Gas Corp. is seeking permission to build the first natural gas pipeline in the state.

The company proposes to run the line from North Adams, Mass. to Pownal and on up to Bennington. It would be a spur from a present line entering Massachusetts at North Adams. The line comes into New England from natural gas fields in the Southwest.

Vermont Gas Corp. was chartered in 1949 as a Brattleboro concern. It took over some operations at that time which formerly were carried on by Central Vermont Public Service Corp.

For smooth floating action and a perfectly centered swing every time, you can't beat the sensational new Lancaster complete diaphragm.

Just one of the important features is the built-in carrier wire assembly. It's an integral part of the diaphragm . . . only adjustment is at the center pan screw . . . saves time and labor . . . assures greater meter accuracy.

Send today for a sample of this first complete diaphragm and test it in your meter shop.

Lancaster METER PARTS CO.
Manufacturers of Quality Parts for Gas Meters
POST OFFICE BOX 37A LANCASTER, OHIO

Companion joins AGA in Mrs. America promotion

The American Gas Association will be joined by the *Woman's Home Companion* in its search for the country's top homemaker in the 1957 "Mrs. America" contest.

S. F. Wikstrom, coordinator of advertising and promotion for the AGA, explained that the monthly publication will have exclusive rights in the magazine field to the name and endorsement of Mrs. America. First kick-off announcement of next year's contest is scheduled to appear in the January issue of the Companion, along with a contest application. After Jan. 20, application blanks will be available at gas company offices also.

Gas utilities will conduct city, county, and state elimination contests for the fourth successive year in each of the 48 states and the District of Columbia. Then the 49 outstanding housewives and their husbands will be flown to Fort Lauderdale, Fla. where from May 7-14, 1957 the ladies will compete in the national grand finals to select a successor to the current Mrs. America.

Gas air-conditioning praised after 5-year test

One of the nation's first completely air conditioned home developments is rounding out its fourth summer with proof positive that people who live in air conditioned homes are better off physically, financially, and even mentally.

Builders and homeowners alike are focusing attention on results of a survey of these homes by the Gas Appliance Manufacturers Association at Valley Brook, Va., a Washington suburb. The area was chosen by makers of gas-operated air conditioning systems for tests of year-round air conditioning for development building because it was felt that the nation's capital and its environs offer wide extremes in weather.

Today the GAMA survey finds that more than two-thirds of the families queried have noticed improvement in the general health of all members of the household. In two of the homes where members

suffered from pollen allergies or hay fever, there was decided improvement. In fact, medical savings in this household were estimated at from $25 to more than $300 per year.

All of the housewives queried reported there were important labor saving advantages on the gas-operated air conditioning systems, especially while other homes in the development were still under construction or roads were being built. Less time was needed for the chores of dusting, cleaning of drapes and upholstery, and less redecorating was required. This saved money, too.

The effect of air conditioning on summer appetites was noted by all those interviewed, particularly where there were children in the family.

Dresser Manufacturing plans new plant

Dresser Manufacturing Division, Bradford, Pa., plans to build a new million-dollar plant in Wellsboro, Pa. The new plant will contain some 100,000 sq ft of manufacturing space and will employ between 200 and 300 persons.

Compressor fittings will be manufactured at the plant, which is scheduled for completion by early 1957.

New Wisconsin firm gets operation okay

Natural Gas Distributors Inc., a new Wisconsin corporation, has received a certificate of public convenience and necessity to distribute natural gas in Kaukauna, Kimberly, Little Chute, and Combined Locks.

NGD will take delivery of gas from the Michigan Wisconsin Pipe Line Co. line at the city limits of Little Chute.

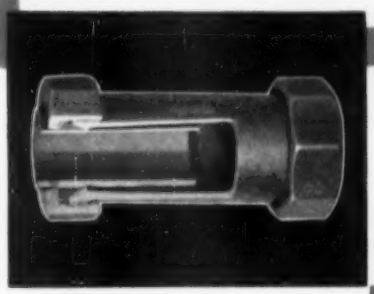
Currently a survey of potential consumers in the Kaukauna area is being made and it is planned that natural gas will be available to all homes in the four communities by the fall of 1957.

Last December the city councils of the communities passed ordinances granting Natural Gas Distributors the right to lay pipes in their streets. At that time the company intervened in the Michigan Wisconsin allocation hearings before the FPC, seeking an allocation of gas for 14 communities in Wisconsin.

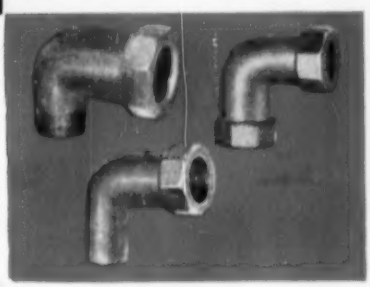
NORMAC

Couplings, Sleeves and Fittings for ☆ UNIFORMITY ☆ DEPENDABILITY ☆ ADAPTABILITY

Normac gas distribution products are engineered and manufactured to meet every requirement of modern gas distribution. Write today for catalog.

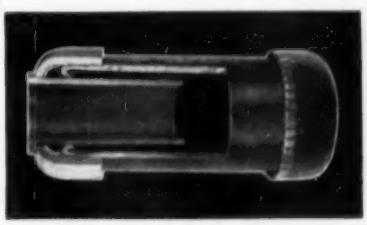


NORMAC COUPLINGS
Normac malleable couplings and sleeves offer the ultimate in deflection and strength with a center wall thickness greater than the wall thickness of the service pipe on which they are used. Every Normac fitting is individually air tested.



COMPRESSION-END "ELLS"
Normac ells of all types incorporate every feature of the Normac coupling plus full coupling depth.

COMPRESSION-END SERVICE "TEE"
Full coupling depth. Special threads on male end prevent dropping into old hand taps.



NORMAC #50-A STEEL COUPLINGS
Manufactured from extra heavy wall pipe. Couplings are available with either seamless or welded centers in sizes from ¾" to 1½" inclusive. 10" and special length centers available.

Normac also manufactures a complete line of red brass fittings in O.D. sizes: ⅝", ¾", 1⅛", 1⅜"—and a complete line of insulated couplings and fittings.

NORTON-McMURRAY MFG. CO.
122 South Michigan Avenue — Chicago 3, Illinois

Couplings · Riser Bars · Sleeves · Cocks · Ball Joint Clamps · Service Tees & Ells

When Midwestern and Tennessee Gas Transmission proposed to bring gas to Wisconsin, they offered to supply gas to 10 of the already-franchised towns. Since these towns were thereby placed in a competitive area, they were precluded by law from obtaining gas from the present Michigan Wisconsin allocation hearings. Natural Gas Distributors then revised its plans and entered an allocation plea for the four remaining non-competitive towns — Kaukauna, Kimberly, Little Chute and Combined Locks. Allocation of gas for these communities is expected soon.

Construction starts on new Rockwell plants

Willard F. Rockwell Jr., president of Rockwell Manufacturing Co., recently dedicated a new Porterville, Calif. plant and broke ground for a new plant in Kearney, Neb.

Construction of the 100,000-sq ft plant in California is underway with completion scheduled for early next summer, about the same time as the new plant at Kearney.

The two newest factories will bring to four the number of plants added to the company's meter and valve division in the last half of 1956 and first half of 1957. A 100,000-sq ft plant at Russellville, Ky. and a 106,000-sq ft plant at Statesboro, Ga. went into production on a limited scale this summer.

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ARCCO NEVER-DRY PEN
Writes for Months
REPLACES OTHER MAKES • USES REGULAR INKS
Regardless of pulsations or other causes of ink failures this new Never-Dry Pen will make clean and complete records. Ink supply lasts for several months without refilling reservoir. Capillary tube from ink bottle placed in instrument case feeds pen with continuous flow. Closed system sealed from atmosphere prevents clogging and dirt accumulation.
Weight of pen is constant at all times thus insuring extreme accuracy. No slopping or dripping. Stainless steel construction — no corrosion. When ordering, specify make and type of recording instrument.
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Idaho PUC authorizes gas financing plans

Financing plans of Intermountain Gas Co. to raise $8.2 million for construction of gas distribution facilities have been approved by the Idaho Public Utility Commission.

The plan, covering some two dozen southern Idaho communities, includes a cash settlement of $125,000 for Idaho Natural Gas Co., once a bitter rival of Intermountain for distribution rights in Idaho. Idaho Natural, which withdrew from the contest early this summer, will also receive 17,500 shares of $1 par value stock on Aug. 1, 1960.

Of the total amount, $6,880,407 is slated for building local natural gas distribution systems. Construction has started on the first of these.

Intermountain said $423,000 will go for financing its systems. It listed $190,000 for "legal and engineering expenses," explaining that this includes the $125,000 cash payment to Idaho Natural.

Sales show trend toward larger water heaters

Bigger families, ever-growing use of washing machines and dishwashers in the home, and more attention to personal grooming are contributing to the long-range trend toward larger sizes in household models of automatic gas water heaters, according to the Gas Appliance Manufacturers Association.

GAMA's director of marketing and statistics, Edward R. Martin, said the gas water heater industry not only has stepped up sizes of its models, but is turning out units that heat water faster than their predecessors.

During the first six months of this year, 26.2 per cent of household water heaters shipped by manufacturers were with tank sizes of

40 gal. or more. In 1947, the corresponding figure was only 9.2 per cent, and in 1952 it was 10 per cent. At the same time the category of heaters with tank capacity of less than 30 gal. has been declining, from 43.4 per cent in 1947 to 19 per cent of total shipments at the latest tally.

The category of water heaters with 30 gal. or more tank capacity but less than 40 continued to have largest representation. It accounted for 54.8 per cent of shipments in the first half of this year, down slightly from 1952 and 1955 totals, but above the 47.4 per cent of 1947.

Water heaters with tank size of 55 gal. or more accounted for 1.7 per cent of shipments in the first half of this year. This is a larger portion of the market than previously recorded.

Dresser acquires Guiberson Corp.

Negotiations have been completed for the acquisition by Dresser Industries Inc. of the assets of the Guiberson Corp. of Dallas.

Guiberson manufactures specialized oil well production and drilling equipment, drilling heads, gas lift valves, and related products.

The company employs 450 people. No change in personnel or general policies is contemplated. Gordon Guiberson will become a member of Dresser's board of directors and will remain as president of Guiberson Corp.

Wedgewood, Western-Holly consolidate

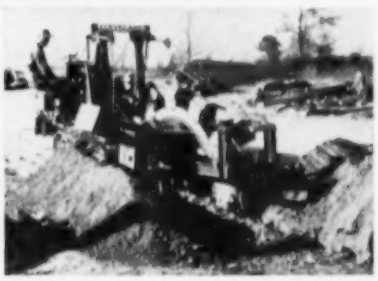
Rheem Manufacturing Co. consolidated its Wedgewood division, gas range producer, with Standard Enameling Co., parent of Western-Holly Appliance Co. on Oct. 1. The consolidated operations will be carried on through Standard Enameling, a new Rheem subsidiary.

Standard Enameling will continue and expand manufacture and marketing of Wedgewood and Western-Holly free-standing and built-in ranges in addition to furnaces and other home appliances. Both lines will be marketed by their present sales organizations.

Rheem-Wedgewood manufacturing will be moved from Newark, Calif., to the Western-Holly plants at Culver City, Calif., and McGregor, Texas.

Under a five-year payment, the

Trenching



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– the standard of the industry for over 30 years – have the features that count in getting these gas jobs done better – faster – safer – cheaper

Check your job requirements now with your Cleveland distributor

THE CLEVELAND TRENCHER CO.

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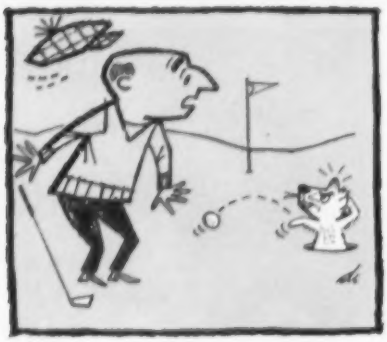
Good Everywhere



What's inside makes a big difference!

A hole in your meter diaphragm means lost accuracy.

Vulcan Synthetic Diaphragms stay dependably gas-tight – won't dry out or crack – need no lubrication.

Vulcan is the pioneer in the synthetic diaphragm field – and stays ahead with ultra modern facilities for development and manufacturing.

Specify Vulcan . . . and be sure

Another REEVES VULCAN RUBBER PRODUCT

REEVES BROTHERS INC.

Vulcan Rubber Products Division

54 Worth Street, N. Y. 13, N. Y.

Gas Meter Diaphragms
Diaphragms for Regulators & Controls

news • *Continued*

consolidation agreement provides for Rheem to purchase all common stock of Standard Enameling and subsidiaries, which include Western Stove Co., Inc., as well as Western-Holly.

Richard S. Rheem, president of Rheem industries, said Henry Honer, president of Standard and its affiliates, would be president of the new subsidiary. Trade names of both companies will continue and there will be no change in product lines for the present, he said.

Saskatchewan towns celebrate arrival of gas

Several communities in the Canadian province of Saskatchewan held official flame-lighting ceremonies recently marking the opening of new gas distribution systems.

Saskatchewan Power Corp., Regina, the distribution company serving the area, reports that the celebrations were held in conjunction with local Boards of Trade and in some cases the Junior Chambers of Commerce. Participating were Swift Current, Biggar, North Battleford, Humboldt and Moose Jaw.

Northern Illinois starts meter shop in LaGrange

Northern Illinois Gas Co.'s new meter shop in LaGrange is under construction and scheduled for completion next year.

An estimated 100,000 gas meters will be tested and repaired annually in the new meter shop, which will be completely air conditioned with gas.

Edward D. Sheehan, vice president of the company, told a gathering at the ground-breaking ceremonies that more than 600,000 gas meters are needed in the company's present activities and that new, modern testing and repairing facilities were necessary. LaGrange was selected as the location for the shop partially because it is the approximate center of population in the utility's service area.

Case, American Tractor make plans for merger

Approval of merger plans has been given by the boards of directors of the J. I. Case Co., Racine, Wis., and American Tractor Corp., Churubusco (Fort Wayne), Ind.

The plan would give Case a broad entry into the construction and roadbuilding fields with a line of crawler tractors and earth-moving equipment.

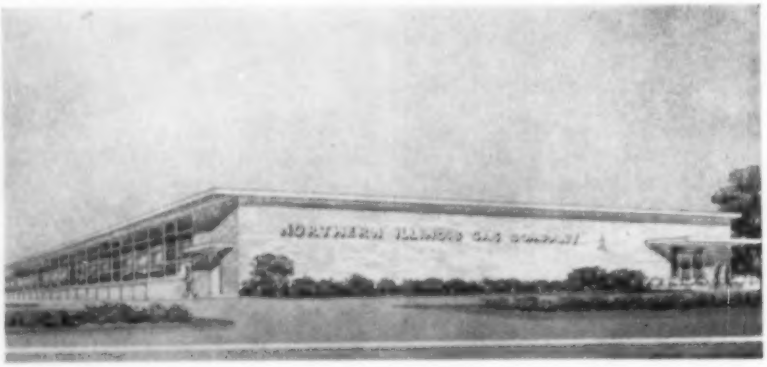
As soon as legal requirements have been met and the detailed merger agreement completed, the proposal will be submitted to stockholders of both companies.

Dominion Natural buys Canadian utility

Dominion Natural Gas Co., Brantford, Ont., Canada, has purchased the assets and business of Port Colborne-Welland Gas Co., producer, carrier, and distributor of natural gas to 850 customers in the villages of Caledonia, Middleport, and York.

The sale included 38 gas wells and 254,000 ft of gas pipe. The newly acquired property will be amalgamated with Dominion's other properties in communities throughout the Niagara peninsula and southwestern Ontario.

A program of maintenance and replacement of the newly acquired



Northern Illinois' new meter shop in LaGrange, Ill., is located in approximate center of population in the utility's service area.

property and equipment is planned by Dominion Natural, according to John R. Reeves, president.

Dominion recently opened a new office, display room, and service center at Tillsonburg, Ont., to serve 2000 customers in that area.

Utility franchise tax studied by New Hampshire

Validity of New Hampshire's electric and gas franchise tax has been challenged in a suit brought by Public Service Co. of New Hampshire. The state supreme court has the case under study.

Public Service contends it should not be taxed on its franchise since the franchise has no value as such, inasmuch as it is not something that can be sold and it may be taken away by the state.

On the other hand, the state holds that a utility franchise does have a value and is a proper subject of state taxation.

GAS news notes

Barth Engineering Co., Oakland, Calif., has been appointed to handle all products of Peerless Manufacturing Co. and Sillers Engineering Co., Dallas. Barth will handle sales of Peerless oil and gas separators, gas scrubbers, dust scrubbers, Sillers Flex-Ring closures, plus other products in the northern half of California.

To consolidate and expand programs of basic research in the fields of chemistry, physics, and nuclear energy, Mine Safety Appliances Co., Pittsburgh, has formed a new wholly owned subsidiary, MSA Research Corp. In addition to handling basic research projects for the parent firm and its subsidiaries and affiliates, the new company will perform similar activities under contracts with government agencies and private industry.

Fisher Governor Co., Marshalltown, Iowa, has named Jack M. Smither & Co. sales representative for Georgia, Florida, and eastern Tennessee. Mr. Smither joined the Fisher sales organization in 1945 and since then has been associated with the offices in Tulsa and Dallas. Howard Wheeler and David P. Thomas will be associated in the Smither office, which is located in Atlanta, Ga.

MOORLANE
METERING EQUIPMENT*

METER RUNS
Raised Face Flange Type
Ring Joint Flange Type
Weld End Type
Ask for Bulletin 462

ORIFICE FLANGE UNIONS
Threaded, Slip-on, Buttwelding
Standard Raised Facing
Standard Ring Joint Facing
A.S.A. 300# thru 2500# Series
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ORIFICE PLATES
Standard Orifice Plates, with or without handles
Holding Ring and Plate Assembly for Ring Type Joint Flange Unions
BLANK or BORED—All materials, Carbon Steel, Stainless Steel, Monel, Brass, etc.
Ask for Bulletin 468

FLOW STRAIGHTENING VANES
Regular and Flanged Type
For any pipe size
Ask for Bulletin 472

Many sizes of ORIFICE FLANGE UNIONS, ORIFICE PLATES and FLOW STRAIGHTENING VANES are regularly stocked, available for immediate delivery.

*Moorlane Metering Equipment is constructed in accordance with the recommendations of the AMERICAN GAS ASSOCIATION Gas Measurement Committee Report No. 3, and/or your specifications.

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The WILKINSON LINE LOCATOR
SEES AND TELLS

It will instantly locate all subsurface pipes, cables and such, and determine their depth too. The etched circuitry, our latest innovation, assures better quality control and performance than the customary hand wiring method. You can avoid damaged structures and loss of time with the Wilkinson Line Locator.

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GAS associations

Bright future forecast at PCGA convention

The years 1956-1959 will encompass the greatest expansion of natural gas facilities in any four-year period of the industry's history was the forecast made by W. F. Rockwell Jr. at the 63rd annual convention of the Pacific Coast Gas Association.

Citing figures prepared from construction data and by the American Gas Association, the head of both Rockwell Manufacturing Co. and GAMA said pipeline and utility companies expect to spend a total of $7.3 billion for new construction and expansion during the next four years.

"There are disciples of doom, gloom and boom. There are those who will try to prove that tomorrow's universe will bear a rubber stamp reading 'Made in Moscow.' There are those who say our nuclear research will lead to self-destruction—or that atomic energy will render all other types of power obsolete along about noon tomorrow.

Tom Arden (center), newly elected PCGA president, confers with his predecessor, Guy Wadsworth (left), and W. F. Rockwell, one of the principal speakers at the 63rd annual convention of the group.

"I'm making a prophecy—based on facts, past performances and what we know of future commitments. The nation's gas industry will assume an even more important role in the expansion of other industries, and in raising the standard of living of American homes. The Pacific coast will set the pace for the gas industry."

Mr. Rockwell told representatives from five western states, Hawaii and British Columbia that 20 years from today the gas industry "will be supplying more than one third of the increased energy demands of our constantly improving standard of living. This will peg total production of natural gas well over 23 billion cu ft a year compared to the current annual level of 10.6 billion cu ft, which now supplies one fourth of the nation's energy."

Heading the PCGA for the coming year is Thomas T. Arden, executive vice president of Robertshaw-Fulton Controls Co. He succeeds Guy W. Wadsworth Jr., president of Southern Counties Gas Co., who will continue to serve as a member of the board.

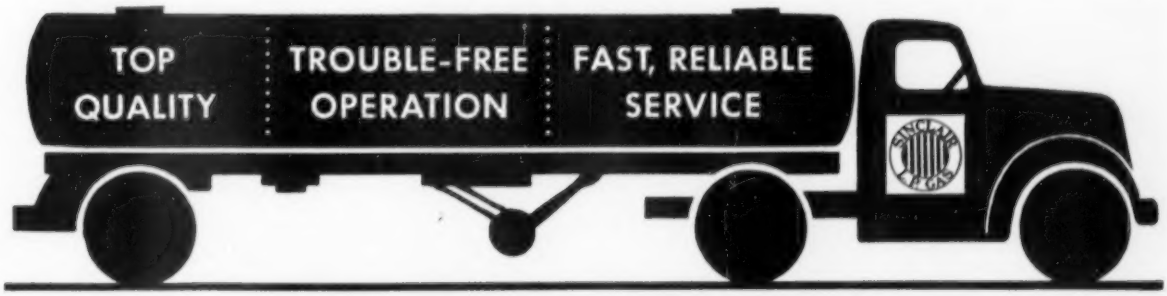
Award winners honored at PCGA convention were Dexter Stoner (left), PG&E, winner of the Basford trophy; Frank N. Seitz (right), SoCounties, and Pat Shea (second from right), SoCal, co-winners of gold medals. They were congratulated by Murray Holloway (second from left), San Diego Gas, who gave report of awards committee; and Guy Wadsworth, SoCounties and outgoing PCGA president.

New vice president is C. H. Gueffroy, president of Portland Gas & Coke Co. Reelected treasurer for the sixth year was Harry McGann, Pacific Gas & Electric.

Installation of officers marked the end of the 32-year tenure of Clifford Johnstone as PCGA managing director. He is succeeded by R. D. Scott, formerly vice president of Honolulu Gas Co.

Call for unit repeated at INGAA meeting

The need for unity within the gas industry — between producer, pipeliner, and distributor — was stressed again at the recent meeting of the Independent Natural Gas Association of America.



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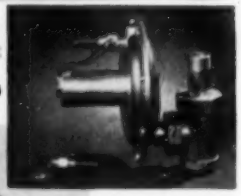

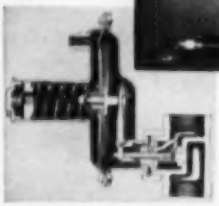

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associations • *Continued*

Lyle C. Wilson, vice president of United Press Associations and chief of UP's Washington Bureau, suggested that the natural gas industry should not remain on the defensive public relations-wise but should get the industry's story of its great contribution to the general welfare of the nation over to the public by telling the public of the great service that is being rendered by the industry and show that it is being done efficiently and at reasonable prices despite difficult problems that must be overcome.

Mr. Wilson also recommended that all businessmen, including gasmen, take a greater interest in the form of government operating in this country, and not look only at the narrower fields of regulation, taxes, and those matters affecting only the businessmen's particular industry.

Men from three segments of the industry—Dean H. Mitchell, president of Northern Indiana Public Service Co., George T. Naff, president of Texas Eastern Transmission Corp., and Charlton H. Lyons, president of the General Mid-Continent Oil & Gas Association, called for unification of the industry.

Each of these speakers recognized the unstable situation for each segment of the industry that has resulted from the Phillips decision, and called for efforts on the part of all to understand each other's problems so that a spirit of unity can replace the controversy that has prevailed between them in the past.

Through such an effort, they maintained, can result legislation under which each segment can live and still not impose any intolerable burdens on any other segment.

The newly elected president of the INGAA, J. J. Hedrick, president of the Natural Gas Pipeline Co. of America and Texas Illinois Natural Gas Pipeline Co., told the delegates that substantial compromise on the part of each segment of the industry may have to be made in order to bring about legislative proposals that would be workable and still conform to the objectives set out in President Eisenhower's veto message on the Harris-Fulbright bill.

Mr. Hedrick said that "the extent to which we are willing to resolve our differences in the

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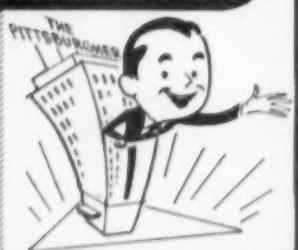

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JOSEPH F. DUDDY, GEN. MGR.

associations • *Continued*

interest of all concerned may well determine whether new legislation would merely change or clarify producer regulation by the FPC; whether it would exempt the producer from regulation through self-executing statutory provisions; or whether the regulation will be that which is most feared by the producer — total regulation, including some measure of regulation of oil production with which it is, in many instances, associated.

"Many believe it is too late for the producer to escape total regulation. It need not be so if our recommendations are economically sound and have been prepared with the realization that each legislative failure to exempt the producer enmeshes the industry deeper and more assuredly in governmental control . . ."

Other new officers elected at the meeting are Glenn W. Clark, president of Cities Service Gas Co., first vice president; W. T. Stevenson, president of Texas Gas Transmission Corp., second vice president. Reelected were F. W. Peters, treasurer of Oklahoma Natural Gas Co., treasurer; Miss Ruth Canaday, assistant treasurer of Oklahoma Natural, assistant treasurer; John A. Ferguson, Washington, D. C., executive director; and Westley E. Disney, general counsel.

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Combined gas exhibit set for hotel exposition

New York's Coliseum will be the scene of the National Hotel Exposition when it opens for the week of Nov. 12.

Once again the industrial and commercial gas section of the American Gas Association will sponsor its largest combined commercial gas exhibit with more cooperating exhibitors than ever before. Covering nearly 4000 sq ft on the street floor, the display of 14 manufacturers of commercial cooking equipment and allied appliances will show the latest models under the blue flame.

Several new pieces of heavy-duty equipment will be on view for the first time. New high-input top burners on ranges which are faster than anything previously available and the popular gas-fired simulated charcoal broilers will be some of the new features seen.

New Jersey gasmen elect Nicolson president

H. Whitcomb Nicolson, general superintendent of the gas division of Public Service Electric & Gas Corp., Newark, N. J., was elected president of the New Jersey Gas Association at its 41st annual meeting held in Spring Lake, N. J. recently. He succeeds Dale B. Otto, president of New Jersey Natural Gas Co.

About 400 delegates heard Dr. Frank T. Barr, senior engineering associate of the Esso Research & Engineering Co., declare that gas would not be replaced as a prime fuel with the advent of atomic energy. He said he does not consider atomic energy a competitor of the gas industry.

Theodore H. Kendall, president of the South Jersey Gas Co., and W. T. Potter of Elizabethtown Consolidated Gas Co., were elected vice presidents and Frank C. Pesveyc of Public Service was reelected secretary-treasurer.

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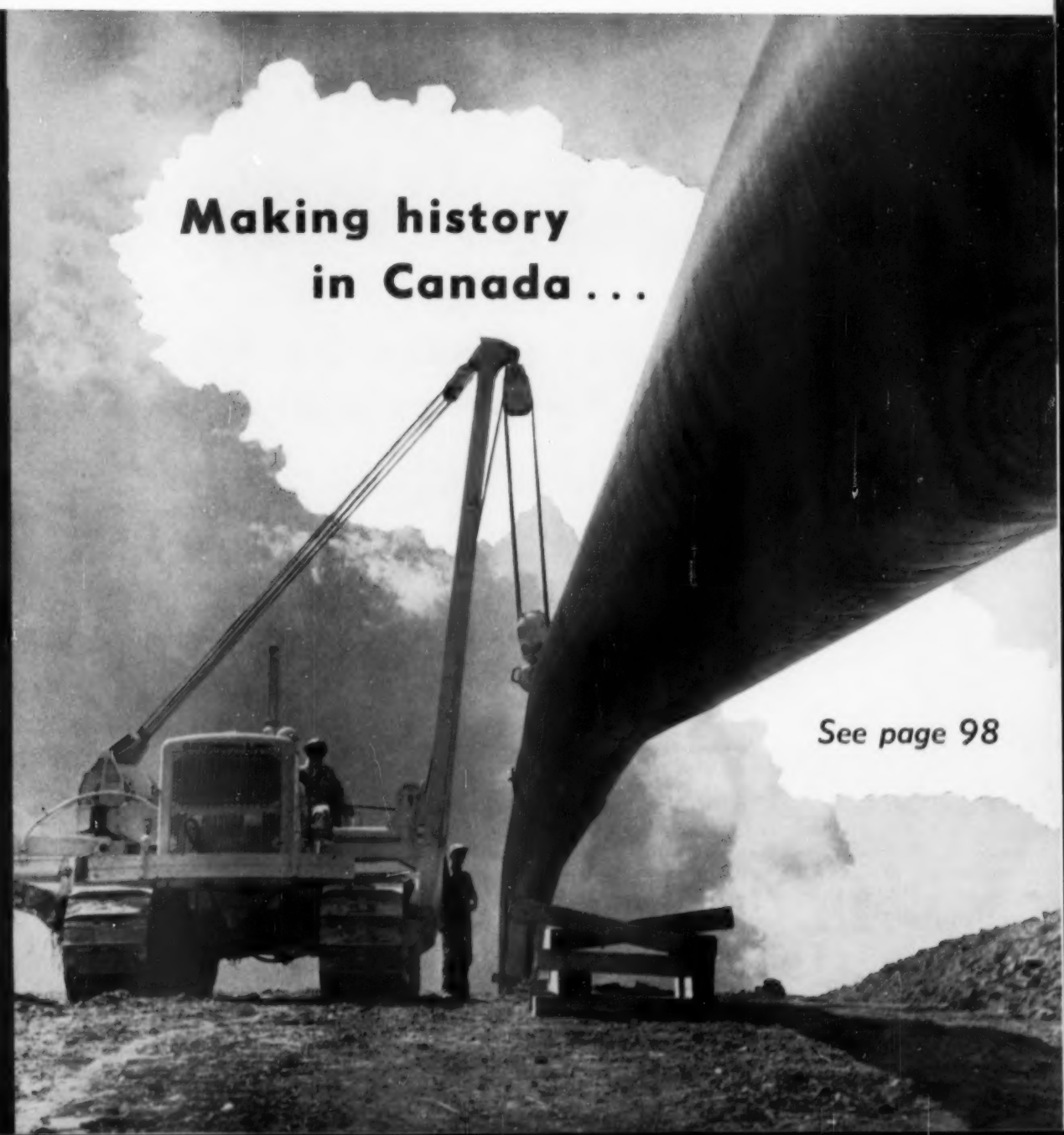

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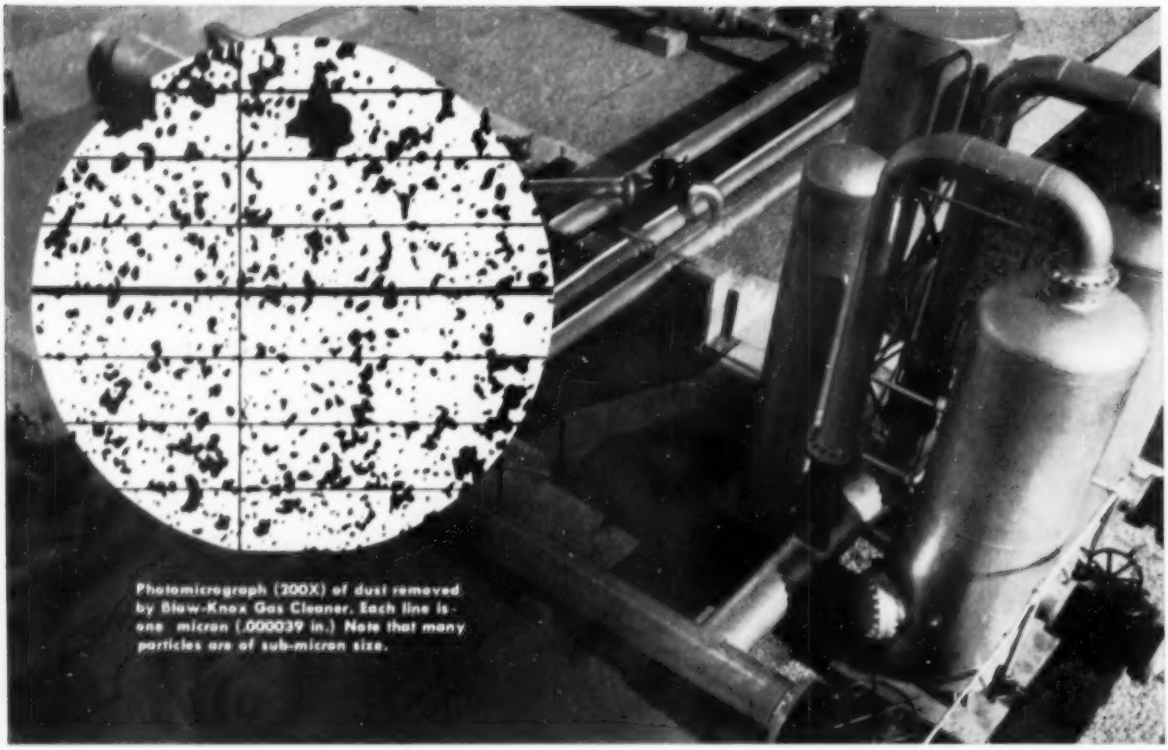
Photomicrograph (200X) of dust removed by Blaw-Knox Gas Cleaner. Each line is one micron (.000039 in.) Note that many particles are of sub-micron size.

dust particles 20 microns and below travel easiest, farthest — do the most damage

Field tests prove Blaw-Knox Gas Cleaners remove even the smallest dust particles

The test of any gas cleaner's efficiency should be measured *not* in terms of the amount of dust collected, but in terms of the quantities entrained in the "clean" gas. The removal of a high percentage of large dust particles is a relatively easy task. However, it is the particle sizes of 20 microns and below that travel easiest, farthest and cause the most damage. Blaw-Knox Gas Cleaners remove even the smallest particles of these dusts.

A large number of field performance tests have been run to determine the dust removal capacity of Blaw-Knox Gas Cleaners. Inlet dust loadings ranged up to 547 pounds per million cubic feet of gas. Tests on the cleaner outlet showed absolutely no dust getting past.

The ability of Blaw-Knox Gas Cleaners to maintain such performance is due to an exclusive operating principle through which each tiny particle of dust is placed immediately in violent, intimate contact with oil. In the expansion separation stages, a major portion of dust-laden oil drops out of the gas stream. An oil-wet, multiple baffle, primary separator catches and agglomerates the remaining tiny wet particles. Finally the gas is scrubbed by an efficient, multiple vane mist extractor.

When you buy, be sure to specify Blaw-Knox, for when you place a Blaw-Knox Gas Cleaner on stream, you're sure to remove even the smallest particles of dust.

Blaw-Knox Electroil and Portable Hot Oil Foggers provide a safe, compact, efficient means of producing a stable oil fog in your gas streams.

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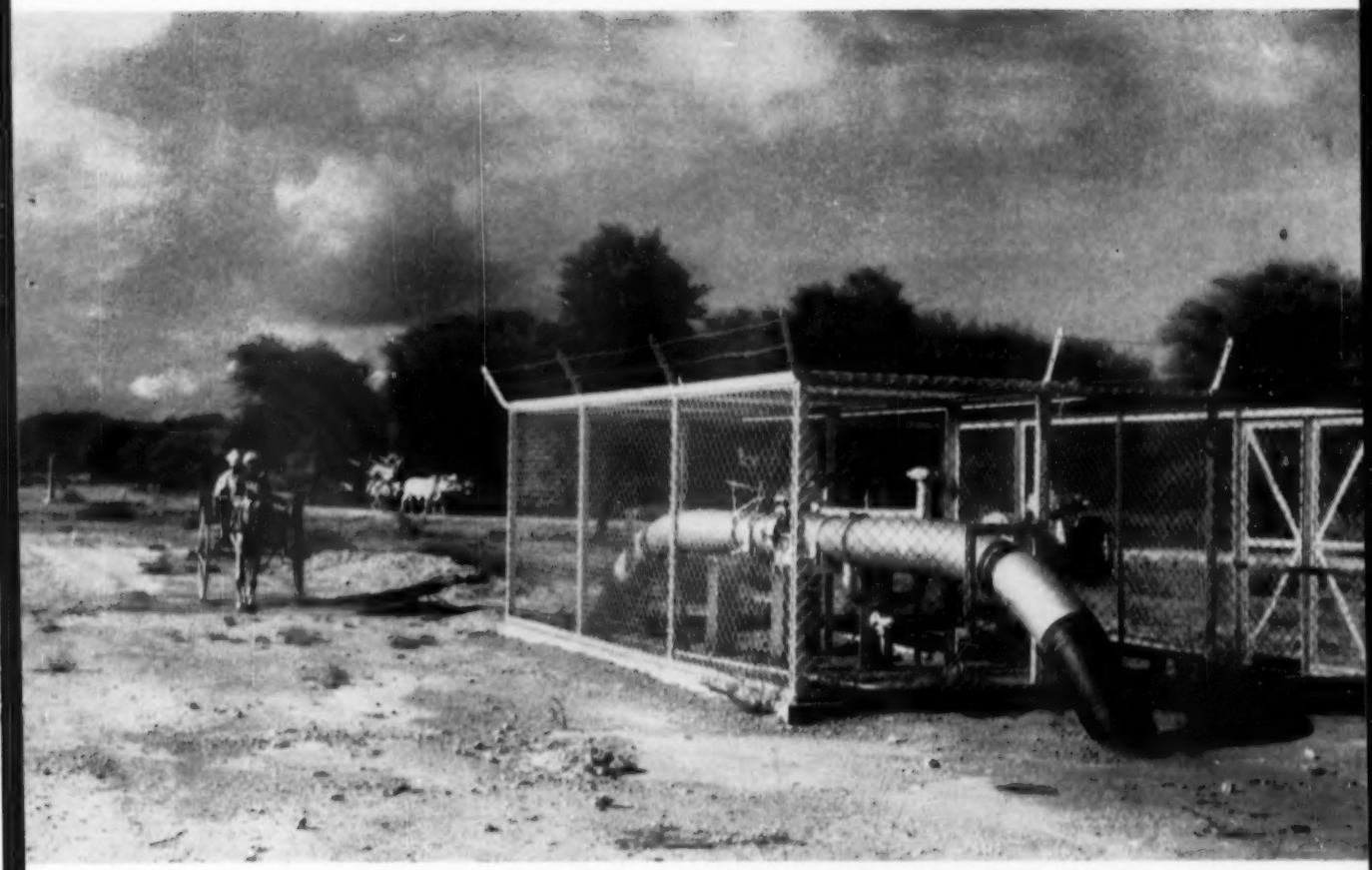


This is one of the main pipeline 12-in. block valve assemblies near Nawabshah. Note the use of right-of-way by local traffic.

Operation of pipeline in Pakistan poses problems

When the Sui Gas Transmission Co. began operating, it was faced with the task of running a 348-mile line with 224 trainees and five experienced engineers. Here is the story of how they overcame this, and many other, operational obstacles.

By H. H. McCAMISH, Chief Engineer (Development)
Sui Gas Transmission Co., Ltd., Karachi, Pakistan

THE operation of a 348-mile, high pressure, gas pipeline along the ancient Valley of the Indus in West Pakistan, where village life is only just starting to change from a pattern followed since before Christ, presents certain unique problems. One could either change normal pipeline operation methods to conform somewhat to the local scene, or attempt to change the local habits in order to operate the pipeline in the normal, modern manner. As an example of the former, the ever-present camels could be used to patrol the pipeline, which is largely inaccessible by vehicle; or in line with the latter, one might introduce the use of airplanes and helicopters for patrolling. In setting up the operation of the Sui gas pipeline, the accent has been on the latter approach, although there has necessarily been some blending of the two.

The pipeline runs in a southerly direction, roughly paralleling the Indus river, from the gas field at Sui in Bugti tribal territory to Karachi on the Arabian sea; and in so doing traverses sand dune

GAS exclusive

Sui Gas' section headquarters No. 1 in the rice lands near Rohri. A 150-ft VHF antenna rises next to office building.

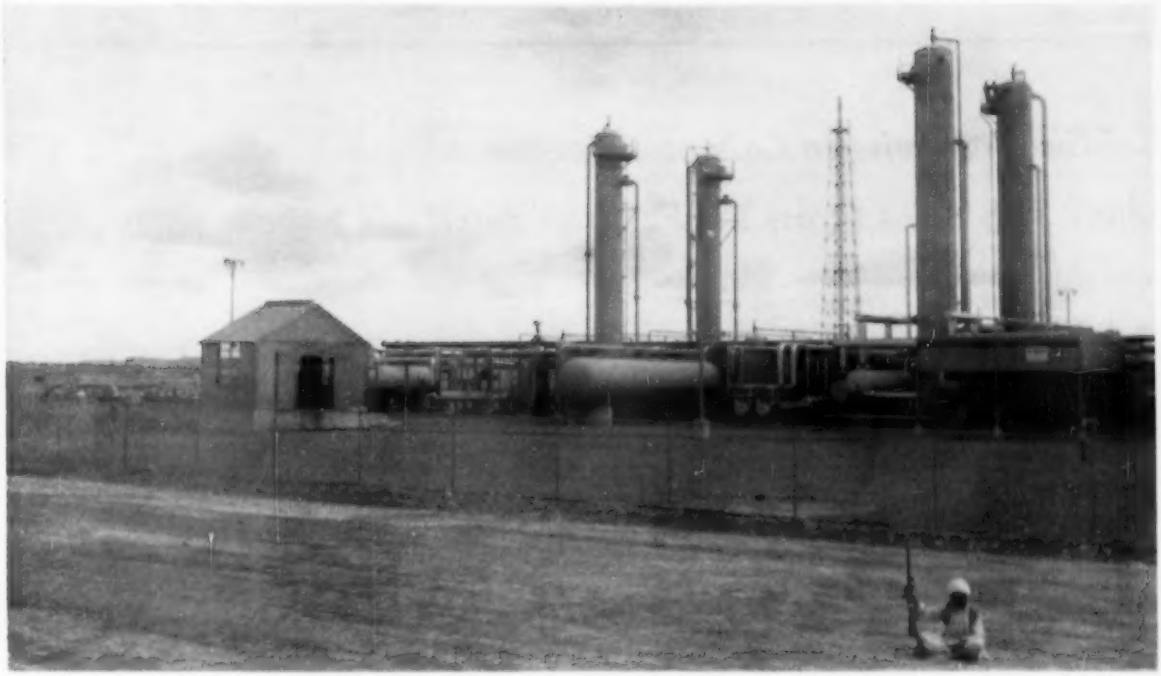
desert, swamplands, and heavily irrigated rice lands. Offtakes are serving gas at Rohri, Khairpur, Hyderabad, and Karachi; and future offtakes are provided for at Nawabshah, Kotri, and Dabeji.

The pipeline was designed by H. H. Hall, a San Francisco consulting engineer, in line with the latest practices in the U. S. The line is designed for 1070 psig for the first 135 miles and for 850 psig for the remaining 213 miles, with the exception of a 1070-psig section downstream of a future compressor station at M.P. 168. The pipe is 16-in. OD seamless steel tubing API X 46, with 5/16-in. wall thickness in the 1070-psig sections and ¼-in. wall thickness in the 850-psig sections, except that for all aboveground piping 7/16-in. wall thickness is used. The pipe is coated with coal tar using a fibreglass inner wrap and impregnated fibreglass as the outer wrap, and is protected with rectifier units.

Mainline regulator assemblies are installed at the points of change in wall thickness, and the 22 block valve assemblies consist of 12-in. lubricated plug valves with 4-in. plug valves on either side for blow-offs and a 4-in. bypass. Special automatic shutoff and blowdown valves have been installed on both sides of each of the two Indus river crossings, which were made in each case on existing dams across the Indus. Marker posts were installed every quarter mile along the route, but considerable difficulty has been experienced in maintaining these in the desert and in the swamplands.

For the control of the pipeline, there are three headquarters stations along the line (Rohri, Daur and Hyderabad) in addition to the purification plant at the gas field and the Karachi terminal at the end of the line. In addition there are five manned radio repeater stations which are situated at intermediate block valves. Under the operations superintendent (who reports to the chief engineer) there is a gas control engineer, a gas metering engineer, a gas engineer (general), and four section engineers along the line with a total staff of 230 employees. The total number of employees is somewhat high because of local customs and conditions

Company's helicopter prepares to land on road near the Khairpur sales meter station.



Bugti tribesman guards purification plant in the Sui gas field.

which require complete workshops, more laborers, shift chowkidars (guards) at stations, and special drivers for all vehicles.

Routine gas control is carried out exclusively by radio using one of the four radio communication systems installed by the company; voice VHF, voice HF, teleprinter VHF, or teleprinter HF. The voice VHF is connected to all stations, whereas the voice HF and teleprinter VHF, and teleprinter HF are only connected to the headquarter stations. In each case the HF normally serves as a standby for the respective VHF system. The station operators along the pipeline transmit hourly pressure readings to the gas control operator at the Karachi terminal, who keeps constant watch on the terminal pressure and offtake volumes as well.

Mainline orifice meters are provided at the headquarter stations to divide the 348 miles into four sections for more closely locating possible gas losses. The gas control section calculates all orifice meter charts and prepares all reports in connection with gas volumes. All orifice meters were designed in accordance with AGA specifications, and the AGA Gas Measurement Committee Report No. 3 (1955) is used for all orifice meter calculations. There is also in the gas control section a small, but well equipped, gas laboratory with a gas analyst who runs special analyses of all sorts as well as routine tests and is responsible for the operation of the recording calorimeter and the recording gravitometer.

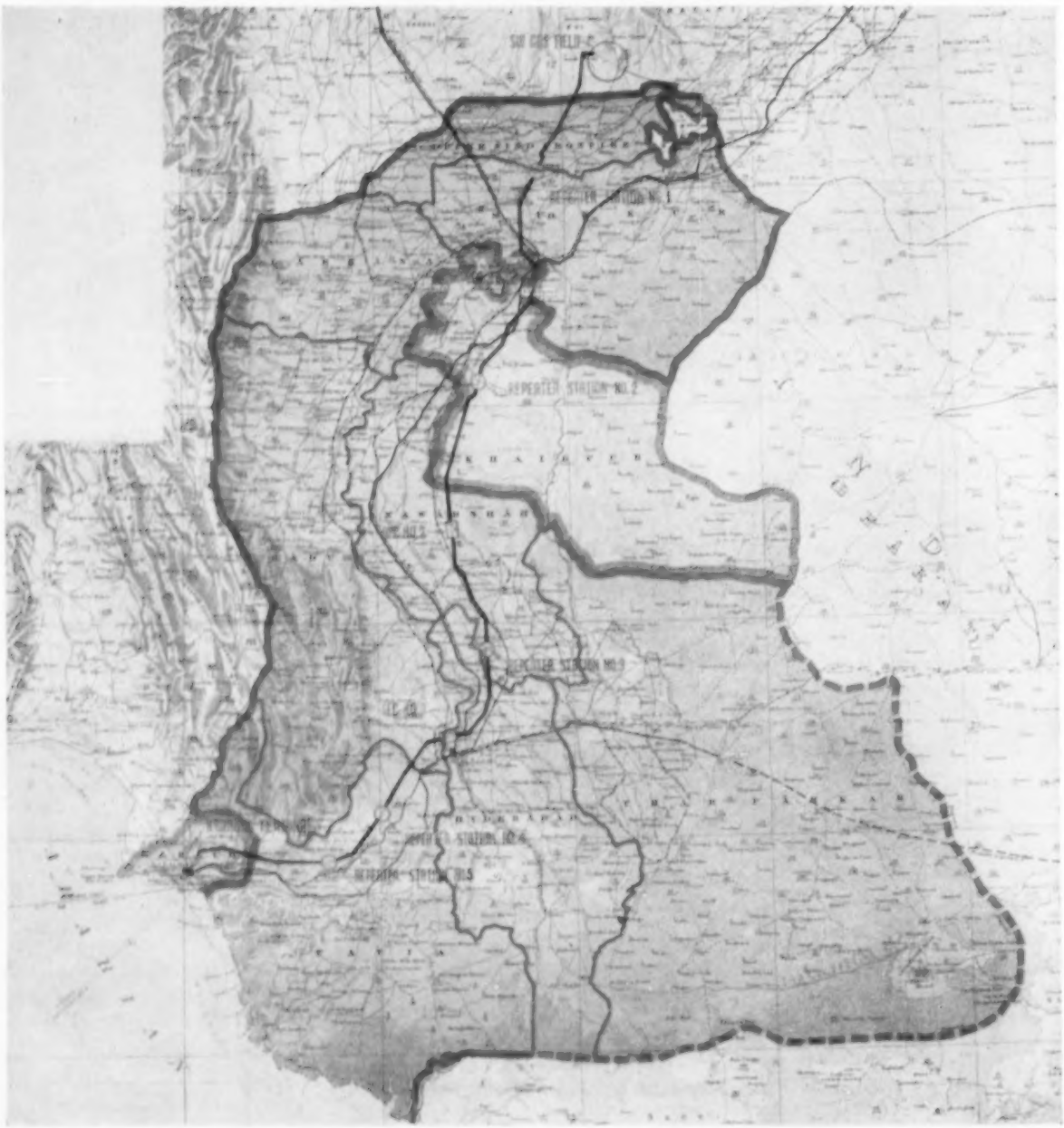
The gas metering engineer is responsible for the operation and maintenance of all metering and regulating, and for this purpose has under him an assistant gas metering engineer and three gas meter repairmen along the line. The gas meter repairmen also do the meter reading and chart changing. The gas engineer (general) handles special engineering studies in connection with operations.

Each section engineer is responsible for the complete operation of a section of the line including the headquarter and radio repeater stations. Gas engines are installed at all seven remote stations for the generation of electricity for communications, cathodic protection, and general station power; and diesel engines are provided for standby at all stations.

Because of the difficult terrain traversed by the pipeline and the fact that roads are virtually nonexistent over much of the pipeline route, routine patrol by vehicle is not practical, and a weekly air patrol is used instead. A two-engine DeHavilland Dove flying at 150 ft is employed for this purpose, and a shuttle system is used which allows each section engineer to fly over his own section on each inspection flight. The inspection flight is also used for mail delivery to headquarter stations, and an additional courier flight is flown each week to provide twice a week mail service. For detailed inspection and special work, a Hiller helicopter is stationed at the Daur headquarters at the midpoint of the line. Each section engineer also has at his disposal several four-wheel drive vehicles equipped with two-way radios, for trips to those parts of the line which are accessible and for bringing in local supplies to the station.

The section engineer at the Karachi terminal is in charge of a workshop and garage. The work-

Sui Gas Transmission Co.'s new pipeline winds 348 miles across the Pakistan desert



shop is particularly essential here because the lack of supplies of the type required by us in the country necessitates making any parts ourselves which we do not happen to have in our own stores. Although each section headquarters has a mechanic for routine automotive maintenance, all major overhauls are done in the Karachi terminal garage. Vehicle maintenance is an acute problem due to the rough country, the lack of roads, and the hot, dusty conditions; and the maintenance of the 25 operational vehicles plus 24 non-operation vehicles keeps four mechanics and four helpers busy full time.

All pipeline equipment and materials are delivered from the Karachi terminal stores to the up-country stations by means of our own four-wheel drive trucks, but there are short periods during the rainy season when certain stations are inaccessible even by these vehicles.

Because of the difficult road situation as well as the distances involved, most trips by the technical staff between Karachi and the up-country stations are by air on the DeHavilland Dove, which is scheduled daily as required on other than inspection or courier flight days. For visits along the line between headquarters, such as to the radio repeater stations, the helicopter combined with the DeHavilland Dove provide rapid and sure transportation. During the purging and testing and the initial operations, the helicopter proved invaluable for quickly transporting senior staff to the points of difficulty and for rapid training all along the line.

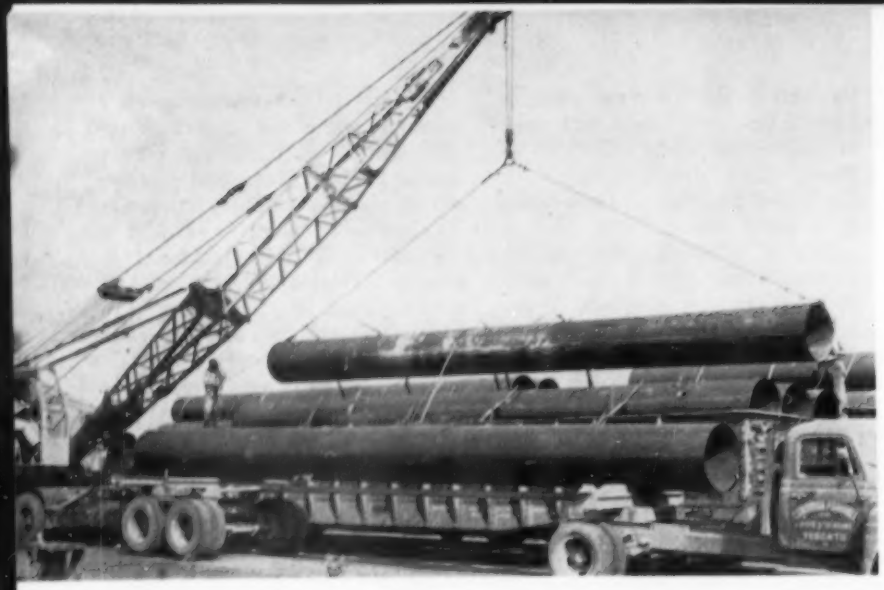
Water is a constant problem—sometimes the difficulty is too much water and at other times it is a matter of not enough. During the rainy season several of our station sites are subject to flooding; and, although we have constructed dikes around the stations and built the buildings on high foundations, there is always the possibility of more water than we have expected. On the other hand over much of the line, desert conditions prevail, and at many stations the supply of sufficient water for personnel and equipment is a real problem. In some cases it has been possible to run a water line from a reasonably close canal, but the canal water is heavily laden with mud and must be allowed to settle and then be filtered (and, of course, boiled for drinking purposes). In other cases, tube wells have yielded limited quantities of water, but almost without exception the water is salty and exceeds the acceptable limits for dissolved solids. At some stations water must still be hauled in by oxen-cart or by paniwallas (men who carry the water in goat skins on their backs).

Security presents special difficulties in our operations due to the isolation of much of our pipeline. Most of the incidents which occur are just the result of idle curiosity (stripping wrapping off of the pipe and scraping paint off to see what is underneath), but in an area where metal is very hard to come by the temptation to remove "loose" pieces (mile post plates, sun shades, bolts, etc.) inevitably leads to some thievery. The only real solution to this difficulty appears to be in designing above-ground facilities so that they are virtually impregnable to malicious mischief.

As the Sui-Karachi pipeline was the first major gas transmission line built on the Indian sub-continent, the greatest problem which we have had to face in putting the Sui gas pipeline into operation has been to properly man the pipeline in a country which has few technicians and no gas experience. Five of the operations engineers were recruited from the United Kingdom, but all positions below that had to be filled from local sources, which virtually meant putting the pipeline into operation with 224 trainees spread over 348 miles of pipeline. The station operators had no knowledge of gas, nor for that matter had most of them ever even seen a plug valve; the chart calculators had never seen a recording chart of any description; and, although the gas meter repairmen had worked with certain orifice meter gauges on oil applications, they had much to learn about gas meters and regulators. The problem was naturally heightened by the fact that the trainees were from a non-technical society where there is limited contact with even simple mechanics, and by the fact that over half of them spoke only Urdu, Pushtoo, or Bengali.

That we have now been in operation for 12 months without a serious incident, can only be attributed to the willingness of the engineers to work around the clock when necessary, and the determination of the Pakistanis to learn. We are still training and improving our methods, but every day confidence grows, and the Sui Gas Transmission Co. is now looking forward to the challenge of constructing a new gas pipeline 200 miles northeasterly from Sui into the Punjab of northern West Pakistan. ■

Company personnel check a cathodic protection point in sand dune area north of Hyderabad as curious natives watch from a distance.



TRADE and commerce in any country depend on transportation for longevity and development. Transportation is progress. Today, our younger sister to the north, Canada, is adding a vital transportation link to her economic life.

That important link is the Trans-Canada natural gas pipeline that will extend from the Alberta-Saskatchewan border through the provinces of Saskatchewan, Manitoba and Ontario to Montreal in the province of Quebec. It is a 2250-mile, large-diameter project.

Pioneers like Mackenzie opened a new and shorter route for trade and commerce by finding the Northwest Passage. Now, industrial pioneers of the United States and Canada have joined hands to build another historical trade route. The Trans-Canada pipeline will transport energy to the centers of Canadian trade and commerce. It is but the start of a new era in that country's development. Even with the completion of this large construction program, Canada's natural gas (and oil) potential will have only been scratched. New pipelines will spring into being and the natural gas industry will progress rapidly as it has in the U. S.

The United States will be an additional market for Canadian gas. Some already trickles across the American-Canadian border. This trickle will enlarge to a steady

Construction of Trans-Canada's most western segments kicked off in early July of this year. Majestic Contractors Ltd. had Spread 1 building 34-in. OD pipeline between Burstall, Sask., and Leinan, north of Swift Current. Canadian Bechtel Ltd. had Spread 2 on 34-in. between Leinan and Pense, east of Moose Jaw. Spreads were each working on 110 miles (approx.). A double-jointing yard was established by Canadian Bechtel at Morse, Sask. Top left shot shows 40-ft lengths of the 34-in. OD pipe being unloaded from railroad cars onto heavy pole-trailer truck equipment for movement to the double-jointing yard.

At the double-jointing yard (center left), two sand blasters (one shown here) take over to remove mill-applied protective coating in the area of the welding bevels. Crawler tractor with pipelayer (background) is picking up sandblasted pipe joint to carry it to welders.

stream when the Westcoast Transmission line (now well under construction) starts delivery to Pacific Northwest's *Scenic Inch* line. In years to come, increased volumes of Canadian gas will flow to American markets and to the virgin natural gas markets in Canada.

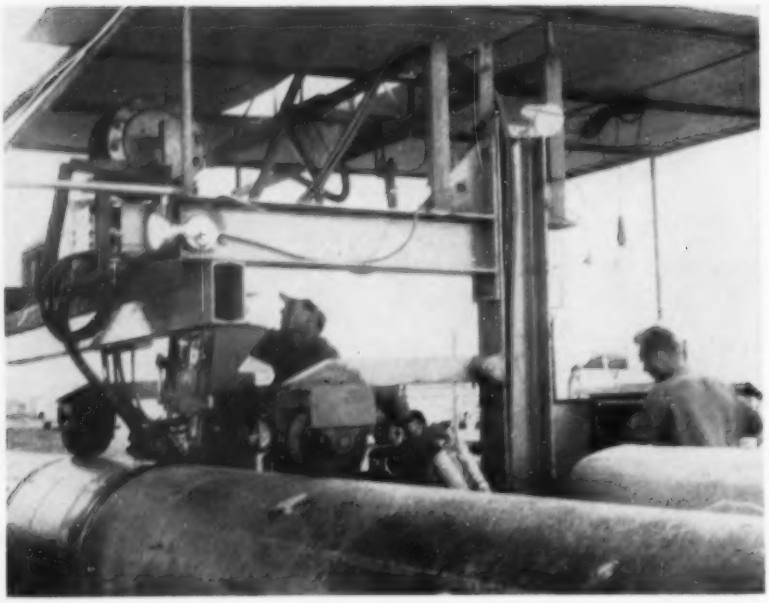
Canada is a relatively new country. Its natural gas industry is in its infancy; yet, in spite of a population of only slightly more than 15 million people, it is the third largest trading nation and ranks sixth in manufacturing volume, Canada's mining, lumbering and manufacturing industries are developing at near-boom speeds. We in the U. S. are inclined to picture Canada as vast "outdoor" nation where the economy is based on harvesting agricultural crops and natural resources for raw materials only. However, this is not the true picture. Today, manufacturing employs more people than agriculture, mining, fishing, public utilities, and finance combined. With new energy available, this industrial development will be enchanced.

Men, material, and natural gas are flowing in both directions across the American-Canadian border at this time. Such cooperation means that these two great nations have found how two peoples can produce growth of both their nations based on the system of individual and competitive enterprise.■

TRANS-CANADA is making pipeline

Two 40 ft sections of the 34-in. pipe are to be double-jointed into a single 80-ft length at the yard (lower left) to facilitate reduction of field welding and pipe handling on the right-of-way. Internal line-up clamp is used to assure pipe walls meet at all points on the pipe circumference. Welders are "tacking" the stringer bead—the first pass that fills the root gap, and slightly above. Proper gap and alignment maintenance are easier on the level ground in the yard than they will be when the 80-ft lengths are joined on the slopes and grades of the right-of-way.

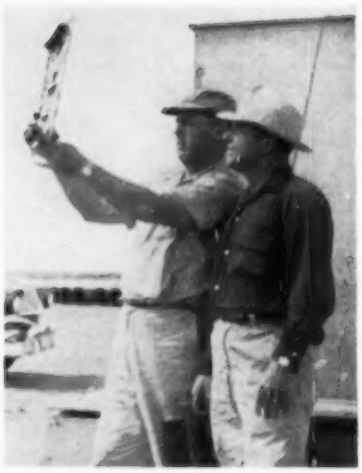
After the stringer bead is run, the pipe moves along to the hot-pass welders (right) who pour in more molten metal from the electrodes to fuse the steel pipe joints. Note the conveyer that handles the heavy pipe efficiently. In the background, the vast stockpile of 40-ft lengths of 34-in. pipe are in view.



A Lincolnweld, submerged-arc welder applies the finish bead to complete the double-jointing at the Morse yard. Welding beads are wire brushed or buffed after each pass. Automatic welders, as shown here, control welding technique to produce technically sound welds in minimum time. The 80-ft double-jointed section is revolved automatically as the welding machine applies its work.

Trans-Canada is making pipeline . . .

Pipeline construction pictured is in the Great Sand Hills, south of Leader, Saskatchewan that pipeliners from Canada, Texas, and the rest of the United States expected to be unusually rough. However, passage through this geographical obstacle was not too difficult —due to the many years of experience of the men, and the ruggedness and mechanical development of the equipment.



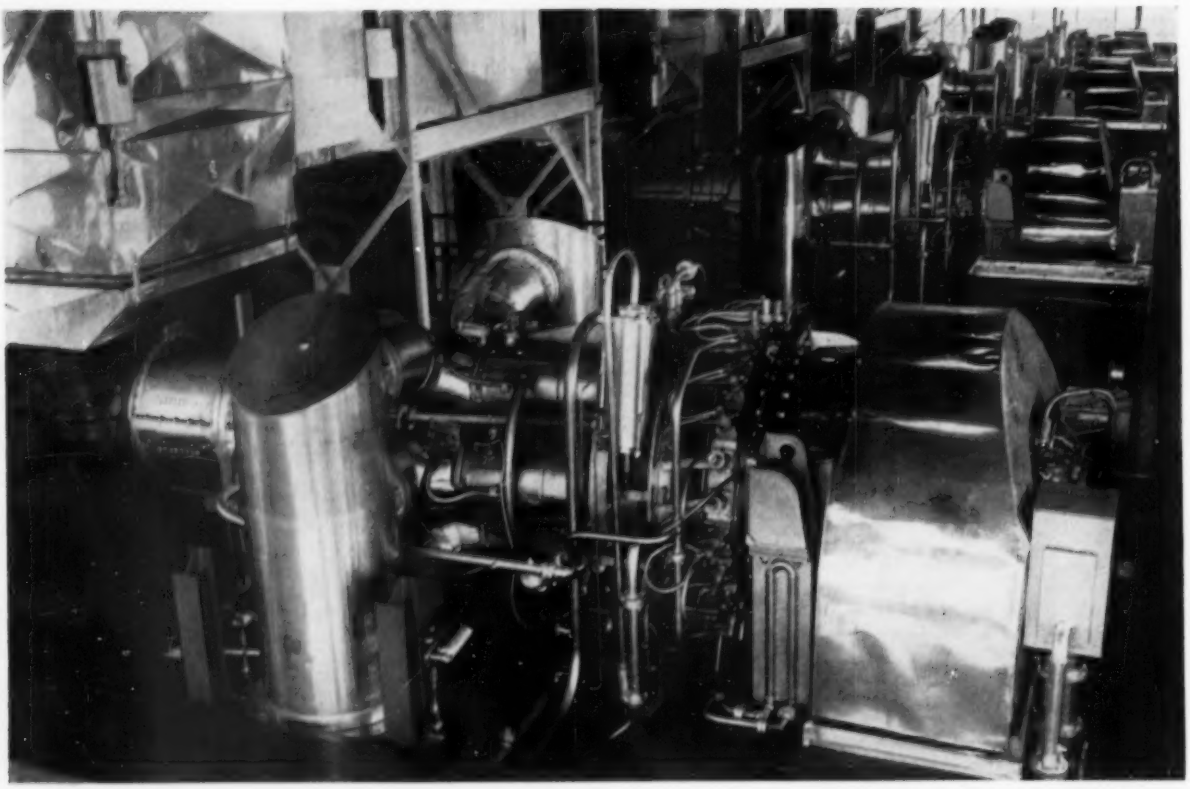
Experienced welding inspectors "read the picture" produced by X-raying each completed weld in the jointing yard. X-ray negative reveals any imperfection in the welds. Joints with flaws mean that the 80-ft pipe joints are shunted aside, the poor weld cut out, and the two pipe joints rewelded and inspected. Sound welds are the assurance that two lengths of pipe are joined to produce trouble free and long life for the designed service conditions.

Pipeliners fight roots of scrub growth as a trenching machine rips a 6-ft deep trench through the fine-grained sand in Canada's Great Sand Hills area. A few cave-ins were experienced, but on the whole, the ditching machines rolled through this terrain at the rate of a mile a day. Other tough pipelining country lies ahead of the Trans-Canada line — notably, the Laurentian Schield of the Ontario Bridge.

Characteristics of the tightly packed, fine-grained, Great Sand Hills cover is evident as the line-up or pipe gang aligns 40-ft lengths of the 34-in. pipe (double-jointing was not employed on this spread). Tractors handle the heavy steel as the stringer bead welders (to the rear) make the initial pass to join the lengths into a solid welded line. Line-up clamp moves a joint ahead of the welders. Erosion will be a problem here.

About 30 6000-lb concrete river clamps are applied to the pipeline as it passes through swamp and slough at a water hole near Chaplin, Sask. Bulk and weight of loads and equipment are clearly shown. Additional wrap of pipeline felt and enamel protect the initial coating and wrapping on the pipe at the river-clamping points and provide additional dielectric strength.

In the background, backfilled trench indicates the right-of-way is ready for clean-up. Up front, the dope gang applies coal-tar based, pipeline enamel; pipeline felt wrap; a fiberglass wrap; and a kraft paper final wrap to the cleaned and primed pipe. Hard on the dope gang, the lowering-in crew drops the line into the trench. Clamshells had to work in front of coating and wrapping operations to free the trench of sand in some sections as the spread fought through the Sand Hills.



Interior view of compressor building, showing four 5700-hp gas turbines.

Application of gas turbine-driven centrifugal pipeline compressors

By A. L. VAUGHAN, Superintendent, Compressor Stations & Compressor Plants,

Northern Natural Gas Co., Omaha, Neb.

Northern Natural Gas Co. has operated two gas turbine stations through three winter heating seasons. Each of these stations consists of four 5700-hp gas-fired turbine-driven centrifugal compressors arranged in series. Sufficient operating time has transpired to arrive at some definite conclusions as to operating costs and reliability of machines. Here are the results of a recent major inspection and overhaul of two gas turbines.

NORTHERN Natural Gas Co. last year completed its 25th year as a natural gas transmission company. During this quarter of a century, the development of the natural gas industry has made possible the economic use of a product which, in many instances, had been a waste product of the petroleum industry.

Since the initiation of large diameter interstate pipeline systems, the growth of the natural gas industry has been phenomenal. Our own company is in many ways typical of the industry. Our transmission system capacity has doubled in the past five years, and quadrupled in the past 10. These expansion programs have often made necessary a new design for increased capacity before the pre-

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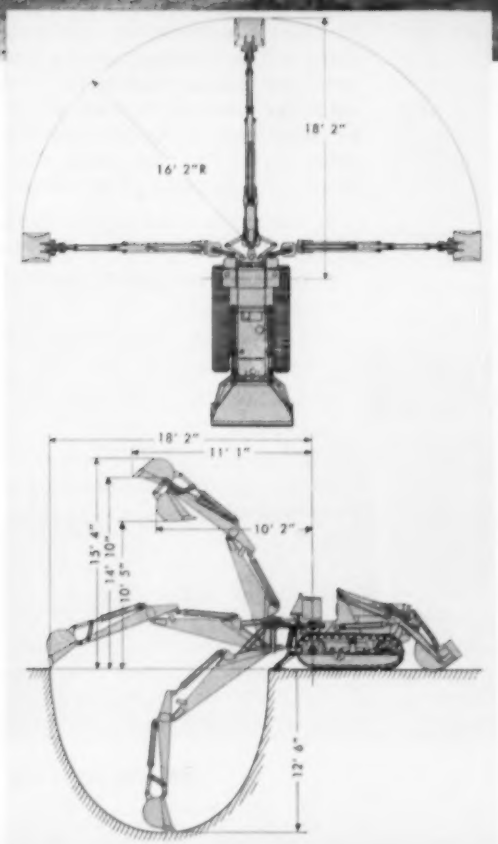

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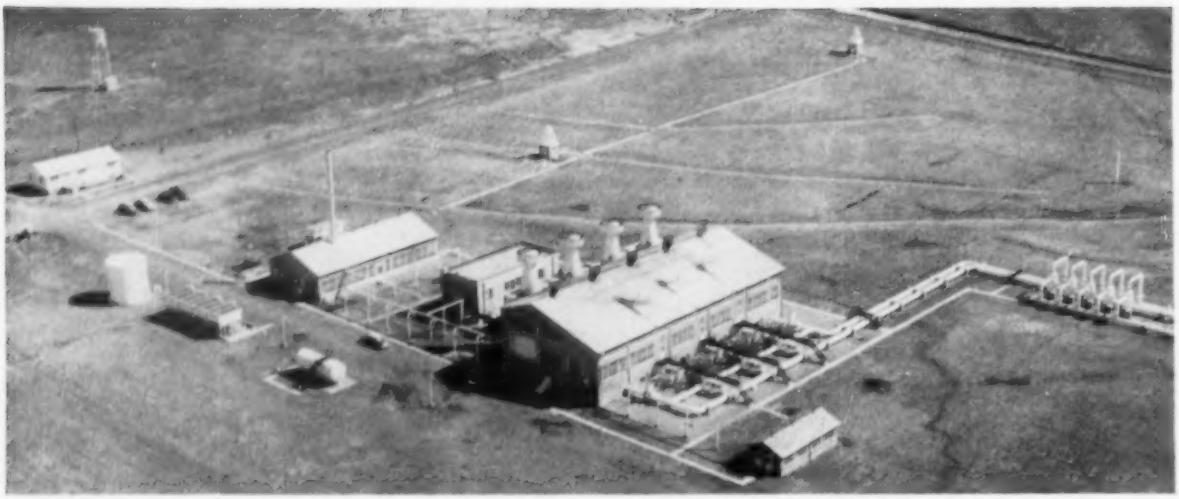


Aerial view of Northern Natural's Tescott (Kan.) compressor station.

vious transmission system design could be constructed and the effectiveness actually determined.

This rapid expansion, along with increasing costs of compressor station facilities, has left the industry in a position where it must be ever cognizant of new developments in equipment and techniques. In many cases the industry has been obliged to accept a new development on a large scale long before it had been thoroughly proven and accepted. Such was our company's position when the decision was made to install gas-fired, turbine-driven centrifugal compressors in the 1953 expansion program. This decision involved the purchase of over 34,000 hp to be installed in two new stations to be located between existing reciprocating stations. To our knowledge, there were only two experimental gas - fired turbine-driven centrifugal compressors in operation prior to initial placement of our order for six turbines in 1952. However, there was one large-scale turbine expansion program then in construction on another company's transmission system. The decision to install turbines in very critical points in our transmission system was not one that could be made entirely on the basis of industry experience with the application. We were convinced that the basic design and principles were good and time must tell the rest.

This article is prepared primarily for the purpose of giving a résumé of operating experience with gas-fired turbine prime movers driving centrifugal gas compressors. To evaluate this operating experience, it is essential to consider first some of the characteristics peculiar to our transmission system and its operation along with some of the considerations leading to the selection of turbines and centrifugal compressors.

In our opinion, there were three basic methods of increasing capacity which were applicable to our transmission system:

1. Additional compressor horsepower at presently existing stations.

2. Increase existing pipeline volumetric capacity to decrease the interstation pressure drop.

3. Install additional compressor stations (usually at mid-points) between presently existing stations.

In actual practice, it is seldom feasible to increase the capacity of an entire transmission system by any one of these three methods alone. Such was the case in the 1953 expansion program when our company increased its salable capacity from 675 to 1007 MMcf/day. Engineering design in final form required 69,000 additional hp, 301 miles of parallel mainline piping in addition to the two new stations at Macksville and Tescott, Kan. The stations were to be located at mid-points between existing reciprocating installations. Choice of locations was dictated by a requirement for a better horsepower-pipeline balance.

The next step was to select a prime mover compressor combination which would best fulfill the requirements of the current design and would be adaptable to needs in the foreseeable future. Initially, the selected equipment must compress 835 MMcf/day of natural gas from 518 to 745 psig, a compression ratio of about 1.4. Also, the equipment must be adaptable to handle future volumes in excess of 1 billion cu ft/day. It was desirable to provide economy of operating labor cost in anticipation of a seasonal fluctuating load factor. Finally, the installed cost was not to be excessive as compared with any other type. The equipment combinations considered are as follows:

1. Gas engines and reciprocating compressors.
2. Gas engines and centrifugal compressors.
3. Steam turbines and centrifugal compressors.
4. Gas-fired turbines and centrifugal compressors.

The combination of gas-fired turbines and centrifugal compressors was selected for the following reasons:

Centrifugals were preferred to reciprocating compressors for operations at very low ratios. The pressure drop across the suction and discharge valves of a reciprocating compressor is relatively unimportant at higher ratios; how-

Centrifugal compressors . . . Major saving has come in reduction of station personnel

ever, at low ratios these losses become significant in compressor efficiency. Inlet and outlet losses of a centrifugal compressor are negligible. There is, therefore, a saving in brake horsepower required to compress 1 MMcf of gas. The large through-put volumes also were factors in favor of centrifugals as the required horsepower could be utilized in a small number of large-horsepower machines—in our case, three compressors.

A fundamental characteristic of gas-fired turbines is their ability to develop more horsepower at low ambient temperatures. This increase in horsepower conforms very well to our load requirements during winter months as is illustrated i *Fig. 1.* Our heating demand is such that the system is placed under heavy load only during those months when low ambient temperatures make extra horsepower available.

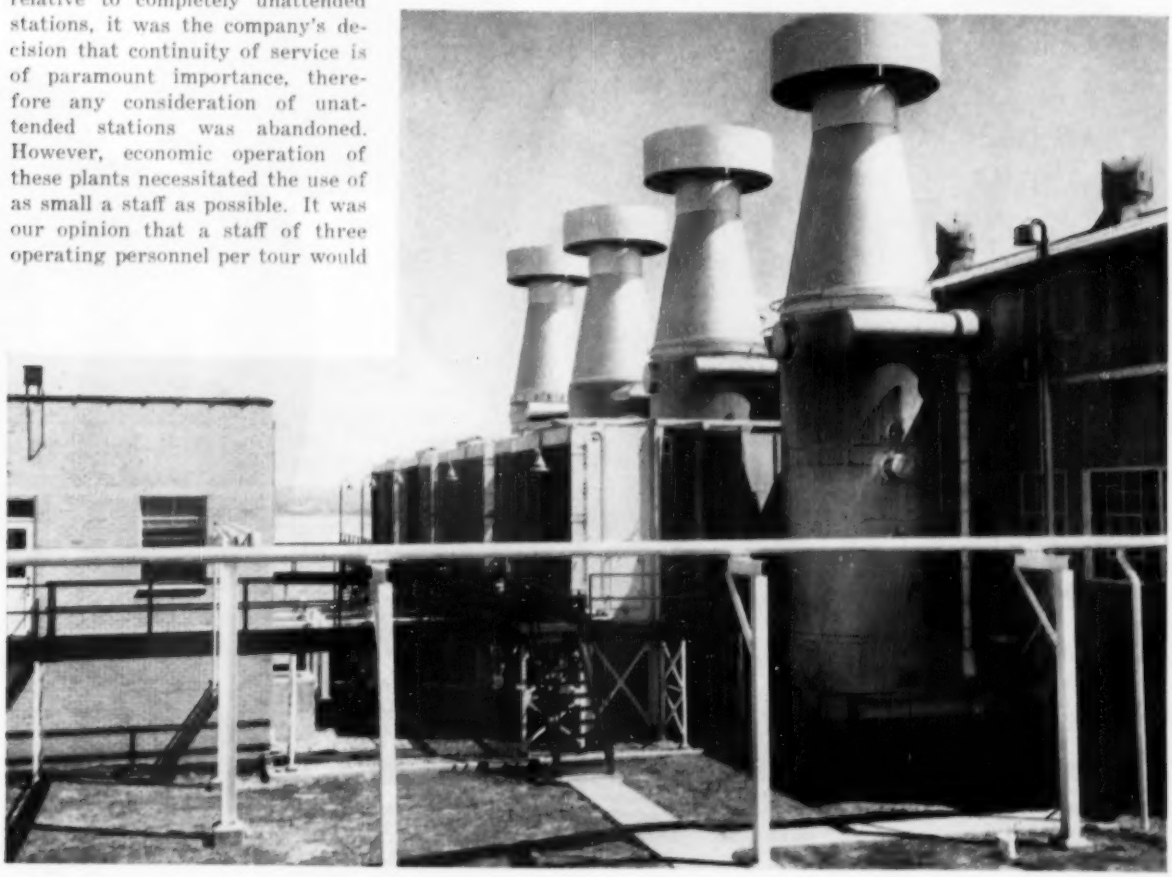
The turbine stations proposed were to be designed for completely automatic operation. Although there has been much discussion relative to completely unattended stations, it was the company's decision that continuity of service is of paramount importance, therefore any consideration of unattended stations was abandoned. However, economic operation of these plants necessitated the use of as small a staff as possible. It was our opinion that a staff of three operating personnel per tour would meet these service requirements. This staffing is still considerably below what could at that time be anticipated for a reciprocating station. Operating labor is a fixed cost whether the plant is or is not in operation.

As our company had no past experience with equipment of this nature, it was necessary to make cost studies in much more detail than was our normal practice for preliminary estimates. Completion of these estimates placed the gas turbines in approximately the same relative cost position as the reciprocating plants. This position was later verified by actual cost figures. The three-unit turbine stations were built for $270 per rated brake horsepower while a reciprocating station of similar size was built for $274 per rated brake horsepower.

Since our first gas turbine was placed in operation in December 1953, there has been accumulated in excess of 52,000 operating hours as of March 1, 1956. These hours include two additional turbines installed in the 1954 expansion program. One of these units was installed at each station, making a total of eight turbines and 45,600 installed horsepower.

During the first 27 months, the

This photo of a Northern Natural station shows the control building at right, the inert air filters and exhaust gas heat exchangers in center, and compressor building at left.



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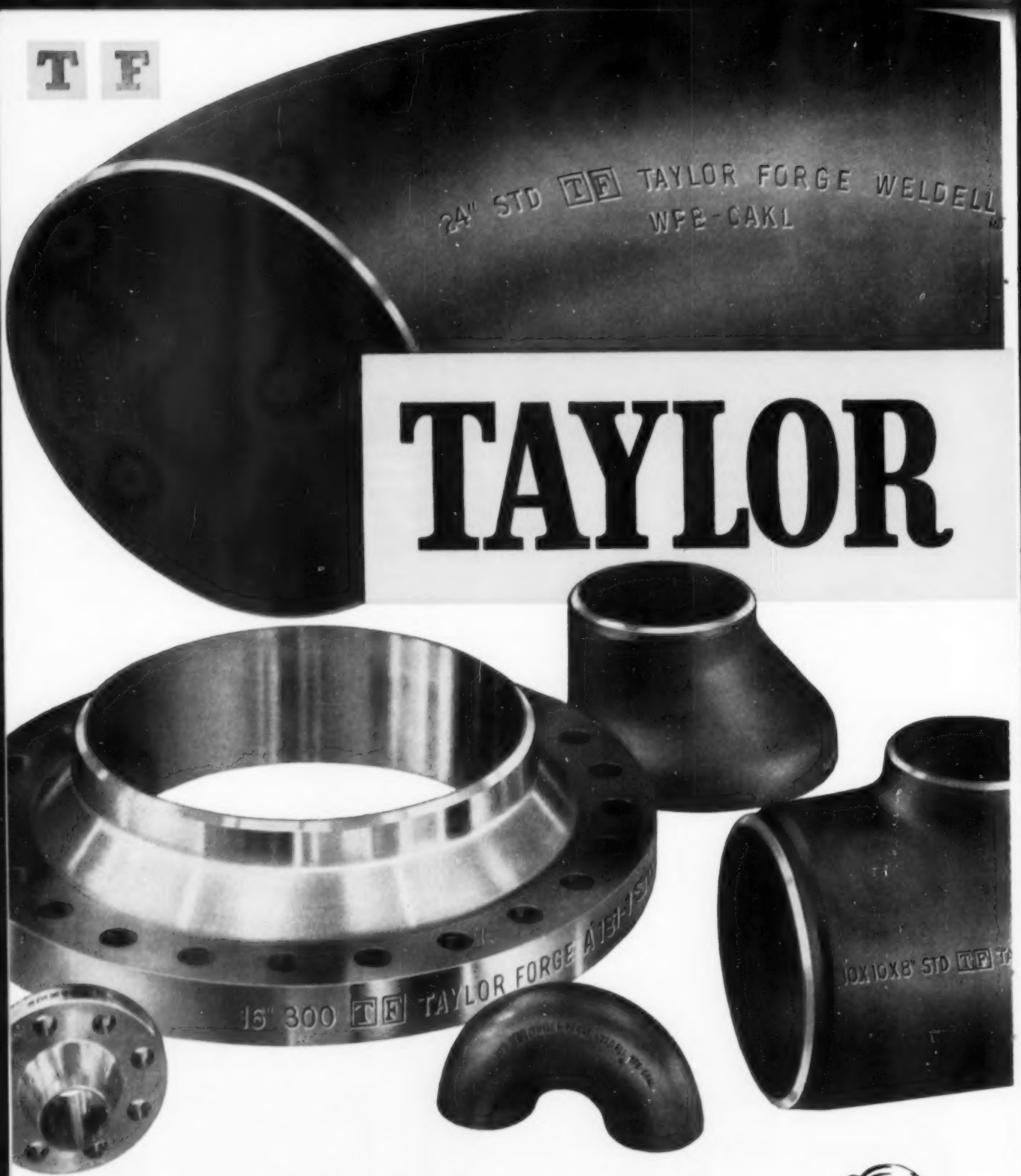


Welding nozzles

T.E.M.A. flanges and channels

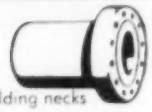
Multiple outlet headers

Production forgings

Venturi reducers

Spiral weld pipe

Large diameter electric weld pipe



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equipment was available for operation in excess of 90 per cent of the time. Considering that these units were not required for lower load-factor operations, the turbine plants here are compared on a basis of availability rather than on a basis of hours operated. For comparison, similar data have been compiled and summarized in *Table 1* for a vertical and a horizontal reciprocating station which also has operated on a similar basis. Although the reciprocating station has a better availability record, it should be noted that the time considered for the turbine includes original station start-up and the early months of operation when the so-called "bugs" had to be worked out of the equipments.

Today, we are confident that the over-all reliability of a turbine station will be comparable with our recriprocating stations. We have one station in which all four turbines have operated continuously over two months without a shutdown. This record may well have been extended had there been continued demand for the equipment.

Operating costs are a prime consideration in the selection of any type of compressor-station installation. *Fig. 2* is a summary of operating costs for turbine and reciprocating stations. The stations considered are not a composite of all reciprocating stations on our transmission system but are specific ones which operate on a comparable load factor. These do not represent the costs which we would anticipate in a reciprocating station of today's design with automatic controls and the consequent lower personnel requirements.

Fig. 2 illustrates that major savings from the installation of turbines has been operating labor. Our turbine stations are currently being operated with three men per tour. An engineer is responsible for operations and is headquartered in the control room which is separated from the turbine room. He is assisted by an auxiliary engineer and an oiler. The auxiliary engineer is required since our company elected to install separate engine-driven generators for power. He is also responsible for attending heating boiler, air compressors, water-treating equipment and other appurtenances. The oiler is primarily the engineers' communications contact in the compressor building. He also participates in general maintenance work and other utility service.

A factor favoring turbines is the low oil consumption for that machine as compared with reciprocating engines. The average reciprocating engine on our system develops 5000 hp/hr for each gallon of lubricating oil while the turbines develop 55,000 hp/hr per gal. Another factor favoring the turbine plant is the smaller requirement for water make-up and cooling facilities. It should be noted that some of the differences in the amount of cooling involved are not inherent in the two applications, but are because no gas cooling is required at the low compression ratios in the turbine stations.

The fuel costs which are compared in *Fig. 2* are totaled station costs including auxiliaries. The cost figures shown are on the basis of rated horsepower, and do not

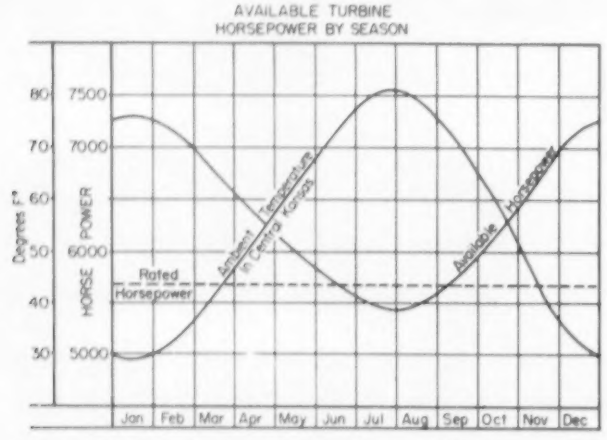


Fig. 1. Relation of ambient temperature to turbine horsepower.

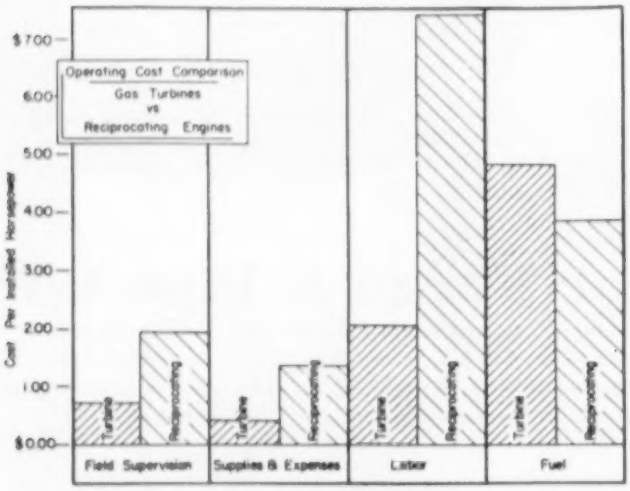


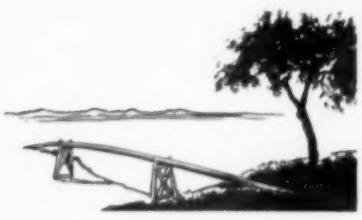
Fig. 2. Operating cost comparison of gas turbines versus reciprocating engines, as based on Northern Natural's experiences to date.

take into account the extra horsepower developed by the turbine at lower ambient temperatures. With this consideration, the turbine plant is actually in a more favorable position with presently installed reciprocating stations than the graph indicates. Averages throughout the system indicate a station fuel consumption including all auxiliaries as follows:

1. Gas-turbine stations
   10,400 Btu/bhp/hr developed
2. Vertical gas-engine stations
   9200 Btu/bhp/hr developed
3. Horizontal gas-engine stations
   10,600 Btu/bhp/hr developed

Turbine-plant maintenance requirements and costs are still a relatively unknown factor so far as Northern Natural is concerned. Currently one turbine has been inspected and overhauled at each of the two turbine stations. This, however, was not done because of the mechanical condition of the equipment, but we felt it was essential to obtain a basis for anticipating future overhaul requirements. Other considerations favoring this program were to prevent the necessity for overhauling all the units the same year and to have trained maintenance personnel when overhaul became a necessity.

Essentially we feel that the experience gained outweighed the early expenditure. At this time, we were able to use our own operating personnel to conduct the inspection. This afforded a twofold advantage in that we pursued this work without increasing our own staff and provided an opportunity for the operating personnel to improve their knowledge of the fundamental composition of the machine. The only additional help involved was a representative of the turbine manufacturer who was retained throughout the inspection in an advisory capacity. On the basis of the experience obtained at these two locations, we will again



Centrifugal compressors . . . Turbine plant maintenance requirements still unknown

this year inspect and overhaul one unit per year at each plant which, if carried out, will make a four-year overhaul cycle. So long as our fluctuating load factor remains as it is, this cycle will involve approximately 15,000 operating hours per unit between major inspections.

If the two turbines which we have inspected are indicative of what we may expect in the future, the maintenance picture is an encouraging one. The internals of both machines were found to be generally in good condition with some relatively minor exceptions.

Shown in *Table 2* is a breakdown of the manhours expended in major inspection on the No. 1 gas turbine at Tescott. We are convinced that the number of manhours shown will be less as the personnel become more familiar with inspection and overhaul procedures. The manhours for major turbine inspection as shown in *Table 2* are considerably less on a rated-horsepower basis than those we have experienced at our reciprocating stations.

When evaluating a maintenance program, a spare-parts stock must be maintained to assure efficient operation. The stock of parts to accomplish this is a very complex thing to define and varies considerably between transmission companies. Northern's spare-parts

TABLE 1. STATION TIME RECORD.

Description	Per cent of total possible operating hours		
	Gas turbine station	Horizontal engine station	Vertical engine station
Hours operating	33.16	37.78	29.67
*Dispatching orders	58.35	60.19	68.76
Total availability	91.51	97.97	98.43
Downtime			
Equipment failure	4.50	0.30	0.17
Overhaul and inspection	3.99	1.73	1.40
Total	100.00	100.00	100.00

* Equipment is operable but not required.

TABLE 2. MAN HOURS EXPENDED TO OVERHAUL ONE 5700-HP GAS TURBINE AT TESCOTT, KAN.

Disassembly		
Axial flow compressor	46:30	
Turbine assembly	185:30	
Controls and accessories	38:45	
Total man hours—disassembly		270:45
Cleaning of parts		196:15
Assembly		
Axial flow compressor	30:30	
Turbine assembly	289:00	
Controls and accessories	48:30	
Total man hours—assembly		368:00
Total man hours to overhaul		835:00
Man hours by manufacturer's representative		128:00

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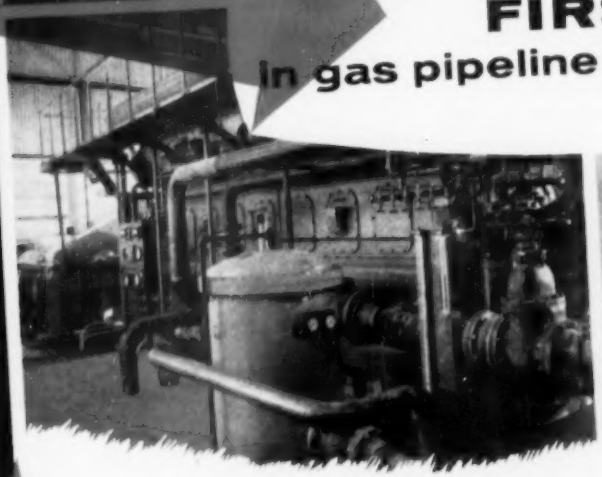
Cooper-Bessemer centrifugal compressor and 4-cycle gas engine, separated by fire wall, com- [illegible] in Gulf Interstate's new satellite station for [illegible] over 400 million cubic feet a day at 935 psi. Note [illegible] of station in view at lower right.

Another important FIRST in gas pipeline transmission



Cooper-Bessemer ENGINE-DRIVEN centrifugal COMPRESSORS

● A new chapter in the progress of gas transmission has been opened at Gulf Interstate Gas Company's new compressor station near Stanton, Kentucky. Here, a Cooper-Bessemer engine-driven centrifugal compressor is the first such unit to go into regular service on a main gas transmission line.

This precedent is a tribute to Gulf Interstate management for alertness and decisive action in the application of promising new ideas . . . here successfully applied through the close cooperation of Gulf Interstate and Cooper-Bessemer engineering. These are a few of the highly significant features:

SATELLITE STATION . . . for remotely controlled automatic operation—*another* "first" for Cooper-Bessemer engine-driven centrifugals.

IDEAL FLEXIBILITY . . . combines continuous heavy-duty performance with ability to meet peak demands. Greatly increases flexibility of line-to-market gas transmission.

EXTREME SIMPLICITY . . . requiring no separately operating auxiliaries, and unequalled in simplicity of control by most alternate methods.

UNMATCHED ECONOMY . . . unsurpassed in fuel economy by any other type of prime mover today. Secondly, instead of 2 to 5 large conventional compressors, this one unit meets entire requirements.

Cooper-Bessemer engine-driven centrifugals offer identical or similar gains in various types of service. Additional installations are already under way. Why not discuss *your* plans with the nearest Cooper-Bessemer office?

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COMPRESSORS, RECIPROCATING AND CENTRIFUGAL • DIESELS • GAS ENGINES • GAS-DIESELS

Centrifugal compressors . . . Water make-up and cooling requirements are small

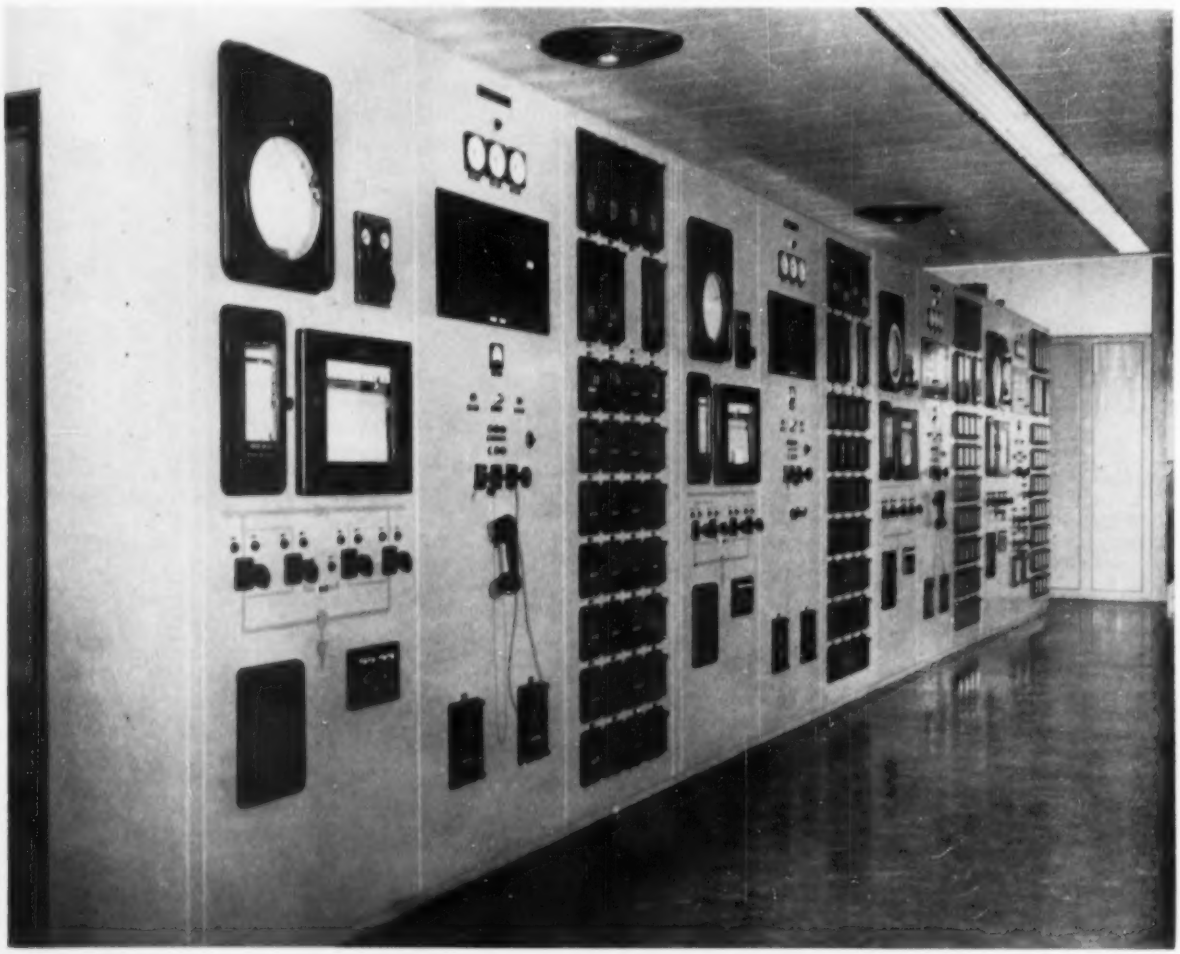
stock inventory is $5.70 per brake horsepower for turbines, which is considerably higher than the $3.15 average for reciprocating stations having vertical gas-compressor engines.

The gas-fired turbines on our system have operated through three heating seasons, in which time the turbines have proved themselves to be equally reliable with reciprocating compressor stations. The projected operating and maintenance costs are difficult to predict since there has been a variable demand for the turbine facilities. However, the operating and maintenance expenses for the turbine stations were approximately $5 per brake horsepower, less fuel, per year as compared to approximately $13.50 for other reciprocating stations which operate on a comparable load factor. The major part of this savings is in operating labor.

From a cost-of-operation standpoint, it is apparent that there is much to be gained by installing facilities with large-horsepower units and to provide sufficient controls and safety devices so that operating labor costs may be held as low as possible. Each installation must be weighed individually to obtain a balance between the cost of operating labor and the need for continuity for services and protection of equipment. We feel that we have satisfied our requirements for this continuity and protection and have still shown a very favorable saving in operating costs.

Our gas turbine experience has left us convinced that the decision to use gas turbines in this particular application was a good one. Our experience to date is such that gas turbines would be considered in any application in which they could be used. However, recent advances in automatic controls and operation of reciprocating engines have made them very strong contenders in most gas-transmission applications. ■

This article was adapted from a paper presented at the ASME Petroleum Mechanical Engineering Conference Sept. 23-26, 1956, at Dallas.



The gas turbines are remotely started, put on line, and shut down from this switchboard located in the station control building.

FPC authorizations add to pipeline network

AUTHORIZATION was granted for more than $461.4 million worth of construction facilities during the year ended June 30, 1956, according to the Federal Power Commission's annual report. The projects are designed to add more than 2.4 billion cu ft daily delivery capacity to the nation's individual transmission systems, according to FPC chairman Jerome K. Kuykendall.

Facilities authorized in the 12-month period include nearly 4400 miles of lines and approximately 255,000 hp in compressor units. The statistics include only facilities okayed for interstate natural gas pipeline companies and do not cover certificates issued to independent producers.

Chairman Kuykendall reported that major projects — those estimated to cost $700,000 or more each—accounted for approximately $444 million of the total construction cost. These major projects increase the daily delivery capacity of systems involved by more than 2187 MMcf of gas per day, and include construction of about 3700 miles of line and nearly 247,000 hp in compressor facilities. The larger projects are expected to benefit 170 cities of 50,000 population or over in 31 states and the District of Columbia, as well as a number of smaller communities. ■

* * *

The table showing construction jobs authorized by the commission from July 1955-June 1956 appears on this and the following pages.

APPROVED CONSTRUCTION JOBS—JULY 21, 1955—JUNE 30, 1956

Applicant and Docket No.	Description and Purpose	Estimated Cost	Communities Benefited (50,000 or more population)
Cities Service Gas Co. G-8572 July 1, 1955	23 miles of 4- to 30-in. replacement of Springfield, Mo., lateral to enlarge facilities to meet increased requirements of existing customers on its system including the Springfield and Kansas City, Mo., areas.	$ 785,240	Kansas—Kansas City, Topeka and Wichita. Missouri—Kansas City.
Lone Star Gas Co. G-8527 July 1, 1955	Construction and operation of permanent connection for heretofore intrastate facilities consisting of 108 miles of 12- and 14-in. supply laterals and 17 miles of miscellaneous 2- to 4-in. laterals in Panola, Smith and Hopkins counties, Texas, to include operation in interstate commerce for continuation of service to existing customers heretofore served from local gas fields in Texas and Oklahoma which have declined in production.	2,905,506 (Including cost of intrastate facilities)	Texas — Dallas, Fort Worth, San Angelo, Waco, and Wichita Falls.
The Ohio Fuel Gas Co. G-8752 July 22, 1955	19 miles of 16-in. loop on Lima, Ohio lateral line to meet normal growth in the Lima area and serve the Standard Oil Co. of Ohio.	715,400	None.
Cities Service Gas Co. G-8780 July 22, 1955	93 miles of 26-in. crossover line in Kansas and Oklahoma, 145 miles of miscellaneous 4- to 20-in. connecting and field lines in Kansas and Oklahoma and a 2700-hp compressor in Oklahoma to augment existing gas reserves.	8,422,400	Kansas—Kansas City, Topeka and Wichita. Missouri—Kansas City and Springfield.
Montana-Dakota Utilities Co. G-8767 July 25, 1955	44 miles of 4- to 16-in. laterals and replacements in South Dakota and Wyoming and 1970 hp units in existing stations in Montana and Wyoming to rearrange system to serve natural gas to Ellsworth Air Force Base in South Dakota and increase service to the Air Force Base housing project.	1,936,915	None
Washington Gas Light Co. G-8882 July 28, 1955	11 miles of 24-in. lateral from Chillum, Md., storage compressor station to a point near Gordons Corner, Md., to meet increased requirements of existing customers in eastern District of Columbia and adjacent Maryland area.	2,000,000	D. C.—Washington. Virginia—Arlington.
Natural Gas Storage Co. of Illinois G-6674 Aug. 15, 1955	31 miles of 36-in. line connecting storage compressor station with Texas-Illinois Natural Gas Pipeline Company near Joliet, Ill., and 4 miles of 4-in. storage field pipelines; drill additional wells; and build appurtenant facilities to increase deliveries from the Herscher storage field.	7,458,000	Illinois—Berwyn, Chicago, Cicero, Evanston, Oak Park and Rockford. Indiana — East Chicago, Gary, Hammond and South Bend. Iowa—Cedar Rapids and Davenport.
Natural Gas Pipeline Co. of America G-8672 Aug. 15, 1955	47 miles of 4- to 16-in. lateral loops in Iowa and Illinois to deliver additional gas from storage to meet requirements of existing customers.	1,572,200	Illinois—Berwyn, Chicago, Cicero, Evanston, Oak Park and Rockford. Indiana — East Chicago, Gary, Hammond and South Bend. Iowa—Cedar Rapids and Davenport.
Transcontinental Gas Pipe Line Corp. G-935 Sept. 8, 1955	27 miles of 30- and 36-in. mainline loops between Louisiana and Maryland to increase system capacity by 10 MMcf/d to transport additional volumes of gas for the Sun Oil from the Southwest to Sun's refinery in Pennsylvania.	3,426,000	None.
Tennessee Gas Transmission Co. G-8805 Sept. 23, 1955	221 miles of 26-and 30-in. mainline loops in Kentucky and Ohio, 376 miles of 6- to 24-in. supply lines and supply line extensions in Louisiana and Mississippi, and 12,540 hp compressor units in new and existing stations in Louisiana, Mississippi and New York to secure additional gas reserves and increase system capacity by 108 MMcf/d to meet increased requirements of certain existing customers and serve certain new customers on system from Mississippi to the New England area.	56,001,000	Virginia — Arlington, Norfolk, Portsmouth and Richmond. Kentucky—Lexington and Covington. Maryland—Baltimore and Silver Spring. Massachusetts — Holyoke, Lawrence, Lowell, Lynn, Malden, Medford, Springfield and Worcester. New Hampshire—Manchester. New York—Albany, Binghamton, New York City, Buffalo, Rochester, Syracuse, Troy and Utica. West Virginia — Charleston, Huntington, and Wheeling.

Table continues on following pages

Fast line-up and field welding is standard procedure when you lay Republic Electric Resistance Weld Line Pipe. Ends of all joints match perfectly, eliminating searching and shifting to secure accurate alignment. Laying-schedules are easy to maintain . . . even to exceed.

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World's Widest Range of Standard Steels

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HIGH-SPEED WELDING, HIGH-PRESSURE SERVICE

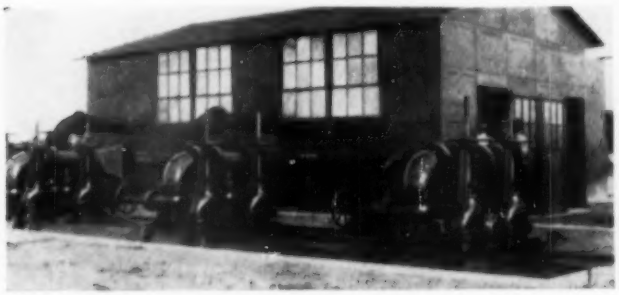
You can count on top welding speed plus maximum operating dependability when you specify Republic Electric Resistance Weld Line Pipe. Why? Because it is uniform in wall thickness, concentricity, size and strength.

Here's what this means to you:

HIGH-SPEED WELDING. Because it's formed from carefully inspected flat-rolled steel, the walls of Republic Electric Resistance Weld Line Pipe are uniformly thick from end to end. This results in uniformly concentric pipe which lines up accurately for fast, easy welding. In addition, the high ductility of the steel makes for smooth, crimp-free bends. It's these consistently uniform characteristics that have made this quality-product so popular for more than 25 years.

HIGH-PRESSURE SERVICE. Rigid manufacturing procedures help assure a uniform high-yield strength throughout every joint of Republic Electric Resistance Weld Line Pipe. Visual inspection of the flat steel before forming results in scale-free surfaces that prevent clogged valves and regulators. Final processing includes a hydraulic test at pressures far in excess of operating requirements. Result is a wide margin of safety, assuring long, trouble-free service.

Thousands of miles of good pipeline experience all over the world have proved that Republic Line Pipe goes in the ditch fast, provides long-term dependability. Types are available for all service requirements. Electric Resistance Weld from 2⅜" through 16" O.D., Electric Fusion Weld from 24" through 30" O.D., and Continuous Butt Weld from ¼" through 4" nominal. Contact your Republic sales office for all of your line-pipe needs. Or mail coupon today for further information.



FAST, EFFICIENT CONTROL of pipeline operations can be secured through use of micro-wave radio communication. Key to on-the-air continuity is tower dependability. The rugged 175′ Truscon® Steel Micro-Wave Tower shown here is typical of Truscon Towers installed all over the world—famous for reliability under all conditions. Available in all sizes, guyed or self supporting. For complete data, mail coupon.

QUICK ERECTION or dismantling and re-erection to meet changing needs are two of the major economic advantages of Truscon Steel Buildings. Ideally suited for control housing, booster stations, field-personnel quarters, equipment and inventory warehousing—Truscon Buildings are fire resistant, well lighted, properly ventilated and easy to maintain. Send coupon for information on wide range of designs and sizes available.

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Company _____
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City _____ Zone ____ State _____

Applicant and Docket No.	Description and Purpose	Estimated Cost	Communities Benefited (50,000 or more population)
			Connecticut — Bridgeport, New Britain and Stamford. District of Columbia—Washington. Pennsylvania — Altoona, Johnstown, Pittsburgh, Allentown, Bethlehem, Erie, Harrisburg, Reading, York, McKeesport and West Mifflin. Ohio—Cincinnati, Columbus, Dayton, Hamilton, Springfield, Toledo, Akron, Canton, Cleveland, Cleveland Heights, Lakewood and Youngstown. Tennessee — Chattanooga, Knoxville and Nashville.
Central Kentucky Natural Gas Co. G-8600 Nov. 14, 1956	21 miles of 20- and 24-in. new connecting pipelines with Cincinnati Gas at the Ohio river and Gulf Interstate at Means, Ky., and 1980-hp addition in Means compressor station to rearrange system to receive an additional 95,000,000 cubic feet of natural gas a day for increased deliveries.	2,474,100	Kentucky—Covington and Lexington. Ohio—Cincinnati, Columbus, Dayton, Hamilton, Springfield and Toledo.
Pacific Northwest Pipeline Corp. G-8934 Nov. 25, 1956	34 miles of 6- to 26-in. connecting pipelines to Canadian border at Sumas, Wash., and Trail, British Columbia, 290 miles of miscellaneous 4- to 10-in. laterals, 4340 hp additions in mainline compressor stations and increases in the sizes of portions of the main line and various laterals previously authorized but not yet constructed. To import 304,000 Mcf of natural gas a day from Canadian gas fields to increase service to previously authorized markets in the northwest area, serve new markets in Washington and Idaho and export a portion to western Canada.	28,549,456 (Includes increased costs due to changes)	Washington—Seattle, Spokane and Takoma Oregon—Portland.
El Paso Natural Gas Co. G-8940 Nov. 25, 1956	413 miles of 34-in. loops on mainline between San Juan, N. M., and Topock, Ariz., 132 miles of miscellaneous 14- to 24-in. supply lateral pipelines in Texas and 60,610 hp in new and existing compressor stations in Texas, New Mexico and Arizona to increase system capacity by 455 mmcf/d to moderately increase service to existing customers in Texas, New Mexico, Arizona, Nevada and primarily in California.	184,603,000	Arizona—Phoenix. California — Alameda, Alhambra, Berkeley, Burbank, Fresno, Glendale, Long Beach, Los Angeles, Oakland, Pasadena, Richmond, Sacramento, San Bernardino, San Diego, San Francisco, San Jose, Santa Monica, South Gate and Stockton.
Nevada Natural Gas Pipe Line Co. G-8997 Nov. 25, 1956	114 miles of 12- and 16-in. mainline loops between Topock, Ariz., and Whitney, Nev., and 42 miles of 6- in. to 12-in. industrial laterals to increase system capacity by 36 MMcf/d to meet increased requirements of existing customers and serve new industrial customers in Las Vegas and Henderson, Nev., areas.	4,103,188	None.
Texas Gas Transmission Corp. G-8828 Dec. 30, 1955	49 miles of 16- to 30-in. mainline loops in Mississippi and Louisiana, 105 miles of 20-in. supply laterals in Louisiana, 44 miles of 8- to 12-in. lateral and lateral loops in Louisiana and Indiana and 19,190 hp units in new and existing compressor stations between Louisiana and Kentucky which will secure additional gas reserves and increase system capacity by 109 MMcf/d to meet increased firm requirements of existing customers, particularly Ohio Fuel.	19,969,000	Kentucky—Louisville. Indiana—Evansville and Terre Haute. Ohio—Cincinnati, Columbus, Dayton, Hamilton, Springfield and Toledo.
United Gas Pipe Line Co. G-8230 Feb. 20, 1956	Construction and operation of 34 miles of 16-in. Baxterville-Hattiesburg, Miss. by-pass lateral, 29 miles of 16- and 20-in. lateral and lateral pipeline loops, 7 miles of 6- to 16-in. storage field pipelines and 330-hp storage field compressor station in Mississippi to increase delivery to Southern Natural Gas by 50 MMcf/d gas a day and develop a new storage field to meet increased requirements.	10,055,832	Mississippi—Jackson.
Southern Natural Gas Co. G-8742 Feb. 20, 1956	52 miles of miscellaneous 4- to 26-in. mainline and branch line loops in Mississippi, Alabama and Georgia, a new supply lateral pipeline in Louisiana and 4950-hp additions in existing compressor stations to increase system capacity by 50 MMcf/d to receive additional gas from United Gas Pipe Line to meet increased requirements.	2,361,219	Mississippi—Jackson. Alabama—Birmingham and Montgomery. Georgia — Atlanta, Macon, Columbus and Savannah. South Carolina—Columbia and Charleston.
Transcontinental Gas Pipe Line Corp. G-9813 Feb. 27, 1956	A 4000-hp field booster compressor station in Louisiana gas field to receive additional gas supplies from Louisiana gas fields to insure service.	841,000	None.
Permian Basin Pipeline Co. G-9688 March 30, 1955	19 miles of 16-in. supply laterals and a 6750-hp field compressor station in Andrews county, Texas to purchase in the field an additional 25 MMcf/d to insure adequate service to Northern Natural.	$2,790,000	Iowa—Des Moines, Sioux City and Waterloo. Minnesota—Minneapolis and St. Paul. Nebraska—Lincoln and Omaha.
Atlantic Seaboard Corp. G-9758 March 30, 1956	55 miles of 24-in. transmission line between Last River, W. Va., and Bickers, Va., compressor stations, and 31 miles of miscellaneous 26-in. mainline loops in West Virginia to increase system sales capacity by 71 MMcf/d to meet increased peak day requirements.	8,521,000	Virginia — Arlington, Norfolk, Portsmouth and Richmond. D. C.—Washington. Maryland—Baltimore and Silver Spring.
Wilcox Trend Gathering System Inc. G-8584 April 23, 1956	22 miles of 3- to 16-in. line and laterals and 4275 hp in new and existing compressor stations in Texas to purchase new gas supplies from independent producers and increase system capacity by 100 MMcf/d for delivery to Texas Eastern Transmission to meet increased requirements of existing customers on Texas Eastern's system.	2,902,000	Massachusetts — Boston, Brockton, Cambridge, Fall River and New Bedford. New Jersey—Atlantic City, Bayonne, Camden, East Orange, Elizabeth, Hoboken, Irvington, Jersey City, Newark, Passaic, Paterson, Trenton and Union City. Ohio—Cincinnati, Columbus, Dayton, Hamilton, Springfield, Toledo, Akron, Canton, Cleveland, Cleveland Heights, Lakewood and Youngstown. New York—Binghamton, Buffalo, Rochester, Syracuse, Troy, Utica and New York City. Pennsylvania — Allentown, Bethlehem, Erie, Harrisburg, Reading, York, McKeesport, Altoona, Johnstown, Pittsburgh, West Mifflin, Chester and Philadelphia. Rhode Island—Pawtucket and Providence. Connecticut—Hartford, Waterbury and New Haven. West Virginia—Charleston, Huntington and Wheeling.

Applicant and Docket No.	Description and Purpose	Estimated Cost	Communities Benefited (50,000 or more population)
Michigan-Wisconsin Pipe Line Co. G-2327 May 7, 1956	252 miles of 4- to 24-in. loops and 3400 hp additions in existing compressor stations in Illinois, Wisconsin, Iowa and Missouri to receive 100 MMcf/d from American Louisiana line to meet increased requirements of existing customers and serve new customers in Michigan, Wisconsin, Iowa and Missouri.	11,500,000	Wisconsin — Green Bay, Kenosha, Madison, Milwaukee and Racine. Michigan — Dearborn, Detroit and Grand Rapids.
Pacific Northwest Pipeline Corp. G-9979 May 8, 1956	Construction and operation of 137 miles of 6- to 10-in. laterals to Yakima and Wenatchee, Wash. to construct a larger lateral to Yakima and Wenatchee in lieu of a smaller line authorized in previous certificate to meet increased estimated requirements.	4,146,146* (New Pipe Line)	None.
Pacific Northwest Pipeline Corp. G-10008 May 8, 1956	50 miles of 4- to 6-in. laterals in Colorado to serve industrial customers in Colorado; namely—Union Carbide Nuclear and Vanadium Corp.	1,062,880	None.
Iroquois Gas Corp. G-9667 May 11, 1956	14 miles of 12-in. connecting line, 22 miles of 4- to 12-in. storage field lines and a 900-hp storage compressor station in New York to expand storage facilities for flexibility of operation and insure service during winter peak periods.	2,877,200	None.
Gulf Interstate Gas Co. G-9900 June 1, 1956	An additional 8000 hp in mainline compressor stations in Louisiana, Mississipi, Kentucky and Tennessee to increase system capacity by 26 MMcf/d to transport gas from Louisiana for the United Fuel Gas.	2,070,000	New York—Binghamton. Kentucky—Covington and Lexington. Virginia — Arlington, Norfolk, Portsmouth and Richmond. West Virginia—Charleston, Huntington and Wheeling. D. C.—Washington. Maryland—Baltimore and Silver Spring. Ohio—Cincinnati, Columbus, Dayton, Hamilton, Springfield and Toledo. Pennsylvania — Allentown, Bethlehem, Erie, Harrisburg, Reading, York and Pittsburgh.
Texas Eastern Transmission Corp. and Texas Eastern Penn-Jersey Transmission Corp. G-8931 June 22, 1956	11 miles of 12-in. loops in Pennsylvania and 13,300-hp compressor units in new stations in Pennsylvania and New Jersey to increase system transmission capacity by 112 MMcf/d to meet increased peak day requirements of existing customers in Pennsylvania and New Jersey, particularly in the Philadelphia and Newark areas.	5,431,700	Connecticut — Hartford, New Haven and Waterbury. Massachusetts — Boston, Brockton, Cambridge, Fall River and New Bedford. Rhode Island—Pawtucket and Providence. New York—Binghamton, Buffalo, Rochester, Syracuse, Troy, New York City and Utica. West Virginia—Charleston, Huntington and Wheeling. New Jersey—Atlantic City, Bayonne, Camden, East Orange, Elizabeth, Hoboken, Irvington, Jersey City, Newark, Passaic, Paterson, Trenton and Union City. Pennsylvania — Allentown, Bethlehem, Erie, Harrisburg, Pittsburgh, Reading, York, Altoona, Johnstown, McKeesport and West Mifflin.
Natural Gas Pipeline Co. of America G-9934 June 22, 1956	25 miles of 12-in. connecting supply laterals, 12 miles of 6- to 16-in. field laterals, and a 3300-hp field compressor station in Roberts county, Texas to purchase and receive into its system 20 MMcf/d from a new gas field.	3,266,302	Illinois—Berwyn, Chicago, Cicero, Evanston, Oak Park and Rockford. Indiana — East Chicago, Gary, Hammond and South Bend. Iowa—Cedar Rapids and Davenport.
Kansas-Nebraska Natural Gas Co., Inc. G-10014 June 25, 1956	23 miles of 6- to 12-in. replacements and 3075 hp in existing compressor stations in Kansas and Nebraska to rearrange system to insure continuity and increase service on a portion of its system.	1,046,350	None.
Texas Gas Transmission Corp. G-10062 June 25, 1956	40 miles of 6-in. to 30-in. loops between Arkansas and Illinois and 12,320 hp in existing mainline compressor stations to increase system sales capacity by 21 MMcf/d to meet increased requirements of certain existing customers in Kentucky and Tennessee.	6,233,000	Tennessee—Memphis. Kentucky—Louisville.
Panhandle Eastern Pipe Line Co. G-1705 June 30, 1956	32 miles of 26- and 30-in. line in Indiana and additional compressor units of 6000 hp in existing stations in Indiana and Illinois to increase system sales capacity by 50 MMcf/d in lieu of facilities previously authorized in order to eliminate a bottle-neck on system.	3,222,638	Illinois—Decatur, Peoria and Springfield. Indiana — Fort Wayne, Indianapolis and Muncie. Michigan—Bay City, Flint, Jackson, Kalamazoo, Lansing, Pontiac and Saginaw. Ohio—Cincinnati, Columbus, Dayton, Hamilton, Springfield, Toledo, Akron, Canton, Cleveland, Cleveland Heights, Lakewood and Youngstown.
Panhandle Eastern Pipe Line Co. G-2433 June 30, 1956	294 miles of 26- and 30-in. mainline loops between Texas and Michigan and 97 miles of 4- to 18-in. lateral loops in Indiana, Illinois and Michigan to increase system sales capacity by 180 MMcf/d to meet increased requirements of existing customers and serve new customers in Missouri, Indiana, Illinois and Michigan.	29,312,415	Illinois—Decatur, Peoria and Springfield. Indiana — Fort Wayne, Indianapolis and Muncie. Michigan—Bay City, Flint, Jackson, Kalamazoo, Lansing, Pontiac and Saginaw. Ohio—Cincinnati, Columbus, Dayton, Hamilton, Springfield, Toledo, Akron, Canton, Cleveland, Cleveland Heights, Lakewood and Youngstown.
Trunkline Gas Co. G-8664 June 30, 1956	24 miles of 26-in. mainline loops in Texas and eight new mainline compressor stations between Texas and Illinois aggregating 56,700 hp to increase system capacity by 85 MMcf/d a day for delivery primarily to Panhandle Eastern to meet increased requirements of Panhandle's existing customers particularly in Illinois and Michigan.	17,686,000	Illinois—Decatur, Peoria and Springfield. Indiana — Fort Wayne, Indianapolis and Muncie. Michigan—Bay City, Flint, Jackson, Kalamazoo, Lansing, Pontiac and Saginaw. Ohio—Cincinnati, Columbus, Dayton, Hamilton, Springfield, Toledo, Akron, Canton, Cleveland, Cleveland Heights, Lakewood and Youngstown.
Panhandle Eastern Pipe Line Co. G-8665 June 30, 1956	Construction and operation of additional compressor units in existing mainline stations in Indiana aggregating 16,000 hp to increase system capacity by 80 MMcf/d with gas received from Trunkline Gas Co. to meet increased requirements of existing customers particularly in Illinois and Michigan.	3,714,000	Illinois—Decatur, Peoria and Springfield. Indiana — Fort Wayne, Indianapolis and Muncie. Michigan—Bay City, Flint, Jackson, Kalamazoo, Lansing, Pontiac and Saginaw. Ohio—Cincinnati, Columbus, Dayton, Hamilton, Springfield, Toledo, Akron, Canton, Cleveland, Cleveland Heights, Lakewood and Youngstown.

GAS pipeline news

FPC denies motion to dismiss TGT-Midwestern applications

Giant American and Canadian gas, oil, coal, and other interests are locked in a titanic struggle that involves:

(1) Trans-Canada Pipe Lines' plan to construct its all-Canadian pipeline with government participation in its initial financing;

(2) The attempt to provide a solution to the perplexing problem of not only bringing presently shut-in Alberta gas to market, but of doing so to the mutual advantage of both Canada and the United States;

(3) The demand for natural gas in Canada and the social and industrial advantages expected to flow from the construction of the Trans-Canada system and its interconnection with natural gas systems in the U. S.;

(4) The increasing consumption and unsatisfied demands in the United States which might be alleviated by a supplemental Canadian gas supply or an appropriate exchange of natural gas;

(5) The need for maintaining sound fuel industries and strong economics both in the U. S. and Canada; and

(6) The investment which the Canadian and Ontario governments and others have or will have in the Trans-Canada system. The impact of this case is being, and will be, felt throughout the American gas industry.

The latest concrete chapter in this industrial battle was written by FPC's Presiding Examiner Francis L. Hall in late September when he denied motions to dismiss applications of Tennessee Gas Transmission Co., its new affiliate Midwestern Gas Transmission Co., and Iron Ranges Natural Gas Co. Some observers consider Examiner Hall's words in his recommendation excoriatingly pointed and, in any case, they left no doubt as to how and why he denied the dismissal. In brief, the case shapes up as follows:

Midwestern wants to build a pipeline from a connection with TGT's existing system near Portland, Tenn. to a tie-in with the Trans-Canada pipeline at the international boundary near Emerson, Manitoba, and Noyse, Minn. This system would have a dual gas supply: (1) from TGT's Texas and Louisiana source fields and (2) through Trans-Canada, from the extremely prolific Alberta gas fields.

Trans-Canada (not officially a party) wants this Midwestern project certificated as it seeks outlets in the American markets to augment its prime purpose of building a gigantic pipeline project to bring western Canadian gas to Canada's eastern markets —a project that has been continually harassed since inception with marketing and financing problems. There is no doubt but what the eastern Canadian markets exist from the population and industry concentrated in that sector; however, the route of the pipeline takes it through unpopulated, sparsely industrialized areas in central Canada where pipelining is rough, uneconomical and, hence difficult to finance. The western segment of this Trans-Canada project is now under construction due to partial Canadian government's support.

Tennessee Gas wants authority to: (1) deliver 204 MMcf/d to Midwestern in Tennessee, (2) supply Trans-Canada's potential eastern Canadian markets with natural gas for three years (or until the Trans-Canada line is completed to eastern Canada) by exporting 48 MMcf/d at Niagara Falls on a firm basis.

Iron Ranges seeks to construct a pipeline system that be in and serve certain areas in Minnesota. It would purchase gas from Midwestern.

Opposition to these applications, and indirectly to Trans-Canada's export-import plans, came from many sources. Intervenors are: Northern Natural Gas Co.; Natural Gas Pipeline Co. of America, jointly with Texas Illinois Natural Gas Co.; Michigan Wisconsin Pipe Line Co., jointly with American Louisiana Pipe Line Co.; Northern Indiana Public Service Co.; the Peoples Gas Light & Coke Co.; and many others. Some intervenors made a motion for dismissal of one or more of the applications based upon the alleged failure of Tennessee and Midwestern to make a *prima facie* case. Mr. Hall's decision was solely concerned with should the motions for dismissal be granted.

Examiner Hall took each contention of the movants for dismissal and tipped them over one-by-one and point-by-point in dramatically succinct — considering the many facets of involvement — fashion.

One of the main contentions by those seeking dismissal is that Midwestern would raid (1) the markets of certain pipeline companies, and (2) the franchise areas of local distribution companies in the Chicago-Gary, Ill. area. Examiner Hall found that Midwestern seeks to extend service to areas in the Midwest not presently being served from any source and that this move was made after determining that its proposal to sell gas to others in that and other areas was unacceptable to the movants. Then, "It (Midwestern) does not deny, however, that, if certificated, it will, in the future, in the course of normal growth and development, serve, like all other pipelines and distributors, any available loads for which authorization can be obtained," (From Examiner Hall's recommendation.)

"There is here presented the unusual situation in which the Commission, with no power to compel additional service by existing pipelines, accepted for filing and set for hearing the applications of Midwestern and Tennessee designed to fill known needs in the Midwest, then have some of the Movants attempt to counter that move in part with applications of their own to serve a major portion of the proposed Midwestern markets," he said.

Prime example of this is the Beatrice, Neb. to Joliet, Ill. pipeline that Natural Gas Pipeline Co. of America has applied for FPC authorization to build. It is significant to note that the application for this pipeline, designed to serve the Chicago-Gary area where Midwestern is proposing to serve large steel companies, was filed on the same day the TGT-Midwestern

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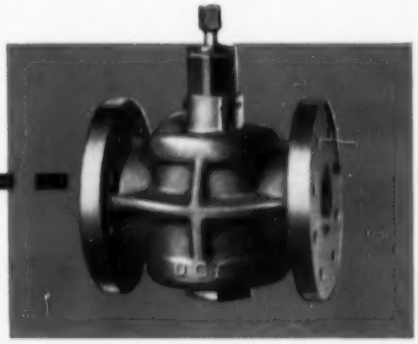
through ACF Round Port Lubricated Plug Valves



A standard ACF Round Port Valve is the perfect valve to use for making hot taps.

The round port of the plug and bore through the body provide a full, unobstructed passage for the tapping drill. True and perfect alignment of port and body bore prevent damage to seating surface.

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KEY RETURN BENDS AND FITTINGS

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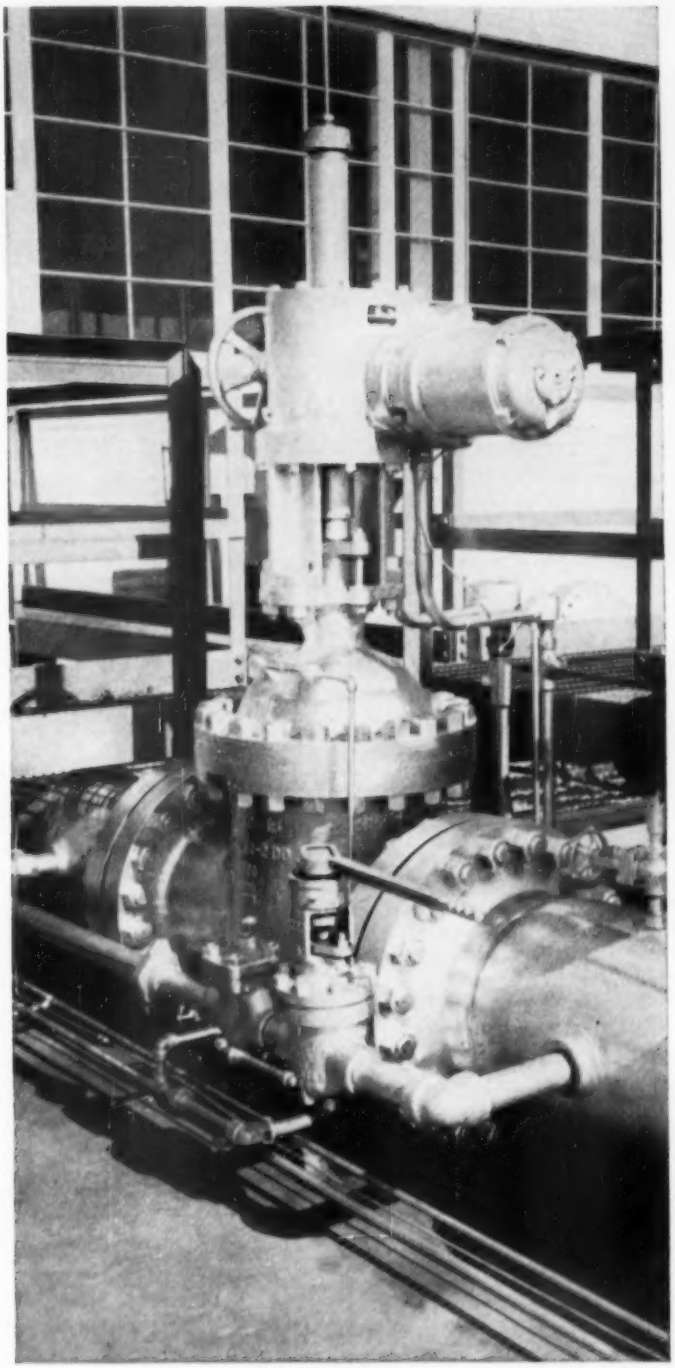
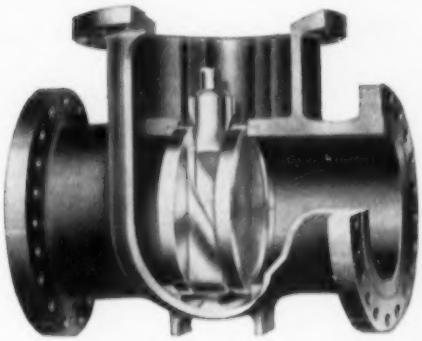
(*Continued on page* 126)



DARLING

fully-revolving double disc
pipe line gate valve



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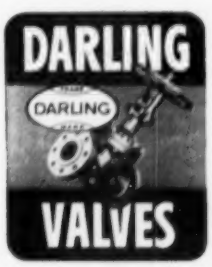
DARLING VALVE & MANUFACTURING CO.

Williamsport 26, Penna.

Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ont.



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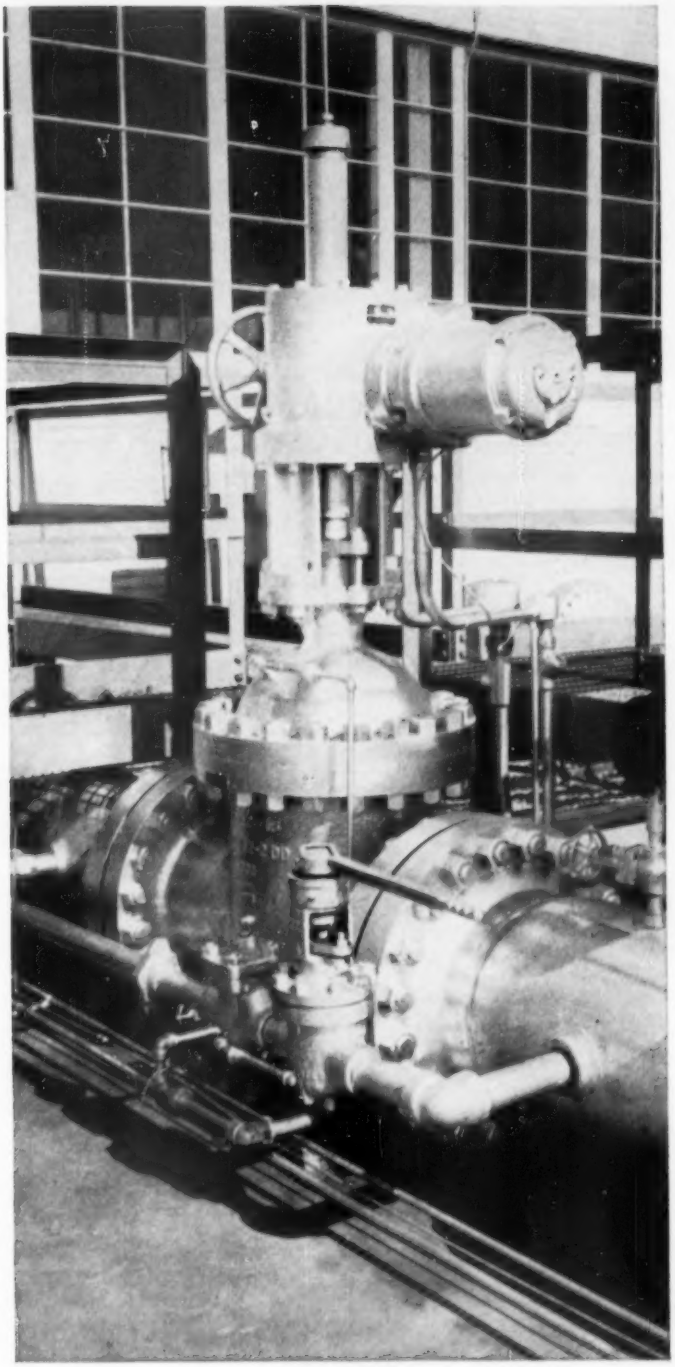

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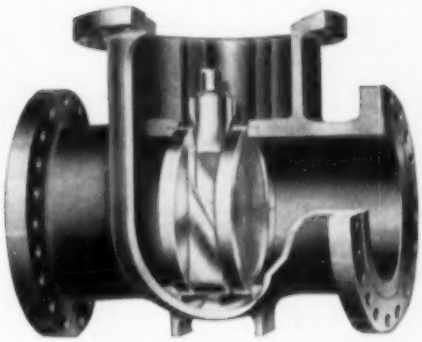
fully-revolving double disc
pipe line gate valve



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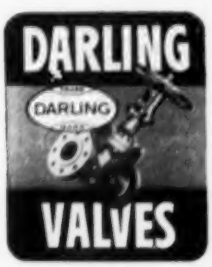

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Philco Series 500 Package is designed primarily for pipe line and railroad companies requiring maximum dependability consistent with highest commercial performance standards along extensive right-of-way routes.

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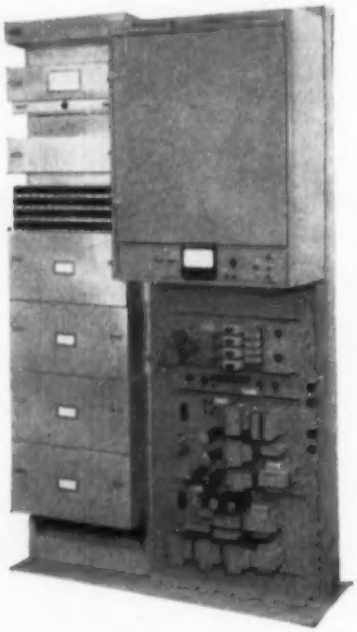
- **Extendable to 40 hops (1000 miles)**
- **Commercial quality circuits**



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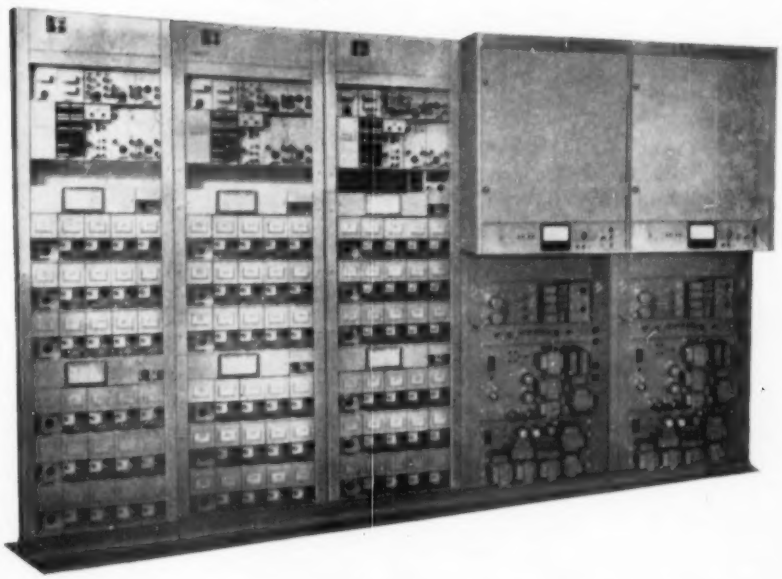
- **Expandable to 24 or more channels (plus service channel)**
- **Extendable to 10 hops**
- **Commercial quality circuits**

Microwave "Packages"



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Philco Series 90 Package is designed to provide the high performance and reliability required by common carriers and government agencies. Full 100% standby with completely automatic switching is included.

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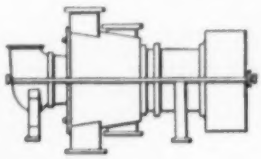

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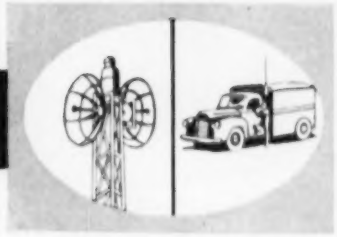


By FRANK CHAPMAN

FCC denies reduced channel separation in 25-50-mc band

In a recent decision adopted by the FCC in connection with its "split channel" proceedings, reduced channel separation in the 25-50-mc band was denied for at least the present. The decision, however, paves the way for split channel use of the band 152-162 mc by the adoption of technical standards for narrow band operation.

A decision as to what services may be benefited by the new channels which will be available through the use of improved standards was deferred. The commission is providing for future use of frequencies separated by 30 kc (same area) and 15 kc (adjacent area) in the 152-162 mc band.

After a thorough analysis of frequency problems in the 25-50 mc band, the decision to not split the channels in this portion of the spectrum was based primarily upon the possibility of international interference together with the unpredictable future of the ionospheric scatter technique, as applied to point-to-point service. The commission stated that it foresees increased interference difficulties in this band and, although improved technical standards were not adopted for equipment operating in this portion of the spectrum, some interference reduction could be realized through voluntary use of "narrow band" equipment.

The FCC's report indicated that many cases of disruptive interference are now being experienced and that the assignment of split channels would only serve to crowd this portion of the spectrum and still further aggravate the interference problem. The commission again urged that mobile licensees employing frequencies in the 25-50 mc band consider the feasibility of transferring their operations to the higher frequency bands.

While the commission did not make a determination as to which services would be benefited by the additional channels obtained through channel splitting, it announced that a series of proceedings would be initiated in order to establish answers to this question. It was further stated that the FCC did not look forward to a general reallocation and that the step-by-step approach of solving many frequency-service problems appeared to be in the public interest.

It was reported that there was considerable difference of opinion among the commission staff members about whether the lower bands should be split. Because of this, it is likely that reconsideration of this part of the proceeding will *be* undertaken.

Interest in this particular aspect of the proceedings is considerable, particularly among those users in crowded areas.

Central Committee will hold annual meeting

The tentative agenda for the semi-annual meeting of the Central Committee on Radio Facilities, which will be held Nov. 13 at the Palmer House in Chicago, has been released.

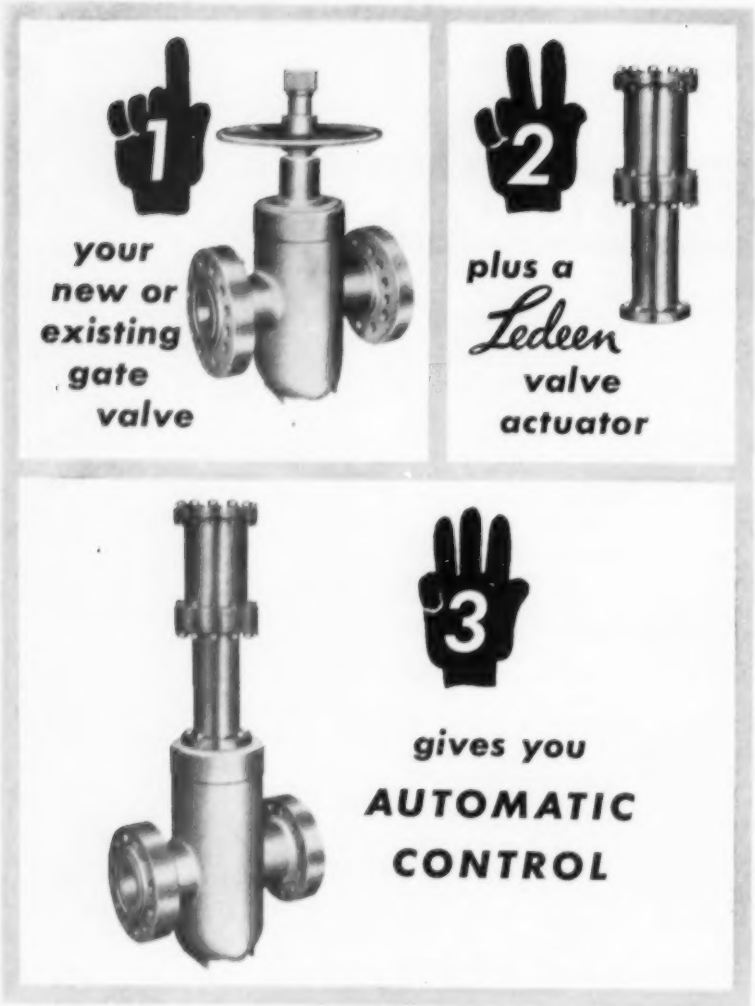
Discussions will cover the following subjects: Reservation of special frequencies for pipeline system operation; reliability of electronic equipment — IBM tests; refinery use of radio; committee's recommendation for revision of FCC forms; 20-kc separation status; microwave rule proposals; Central Committee's letter to FCC on 5-kc increments. Also covered will be an examination of existing microwave specifications; FCC's policy of grants-in-part; Pacific Telephone & Telegraph Co.'s tariffs; the National Petroleum Council's recommendations regarding wartime communications network; working relations and urban transit group; problems created by transmitting tones by radio; long-range VHF communications techniques; Public Law 947; comments on Docket 11709 and Docket 11550 (cooperative use of radio).

Multi-circuit microwave system installed by RCA

Across-mountain communications are provided for the Los Angeles (Calif.) Department of Water & Power with the installation of an RCA multi-circuit microwave radio relay system.

The RCA system links the department's main offices in Los Angeles with a city power plant in Van Nuys, Calif., approximately 15 miles away, and operates through a repeater station mounted atop Lookout mountain.

According to RCA's Russell C. Dubois, manager of communications products sales, the system utilizes standard RCA MM-26A microwave equipment, operating in the 2450-2700 mc band, and provides 12 circuits for voice communications and two tone circuits. The tone circuits are for use in VHF control service to provide communication among the microwave stations and radio-equipped mobile units.



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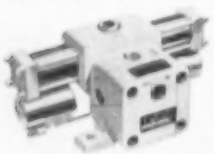

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pipeline news • *Cont'd.*

from page 120

and a new triple-pipeline underwater crossing of the Mississippi.

A 557-mile, 30-in. pipeline will begin in the Mississippi river delta area south of New Orleans, and connect the east end of TGT's new "Muskrat" gathering line with the main system at Portland, Tenn. Its route would be northeast through Louisiana, Mississippi, Alabama and Tennessee.

Another part of the project is 120 miles of 26-, 20-, and 12-in. pipeline to be constructed from the TGT compressor station at Kinder, La., south to the shoreline and into the Gulf of Mexico to offshore wells where about 2 trillion cu ft of gas reserves are located. Some 68 miles of this line would be under Gulf waters.

Also proposed are 332 miles of pipeline to be constructed parallel to the existing system, including 276 miles of 30- and 26-in. in Kentucky, 39 miles of 26-in. in West Virginia, and 22 miles of 26- and 24-in. in Pennsylvania.

A 76-mile, 24-in. pipeline would start at the TGT compressor station at Coudersport, Pa., which is adjacent to the Hebron and Harrison storage fields. The line would run northwest through the Colden storage field to a compressor station near Buffalo, N. Y. The two stations are located opposite each other on the south and north arcs of the company's 1000-mile loop which circles through Pennsylvania, New York, Massachusetts, Connecticut and New Jersey.

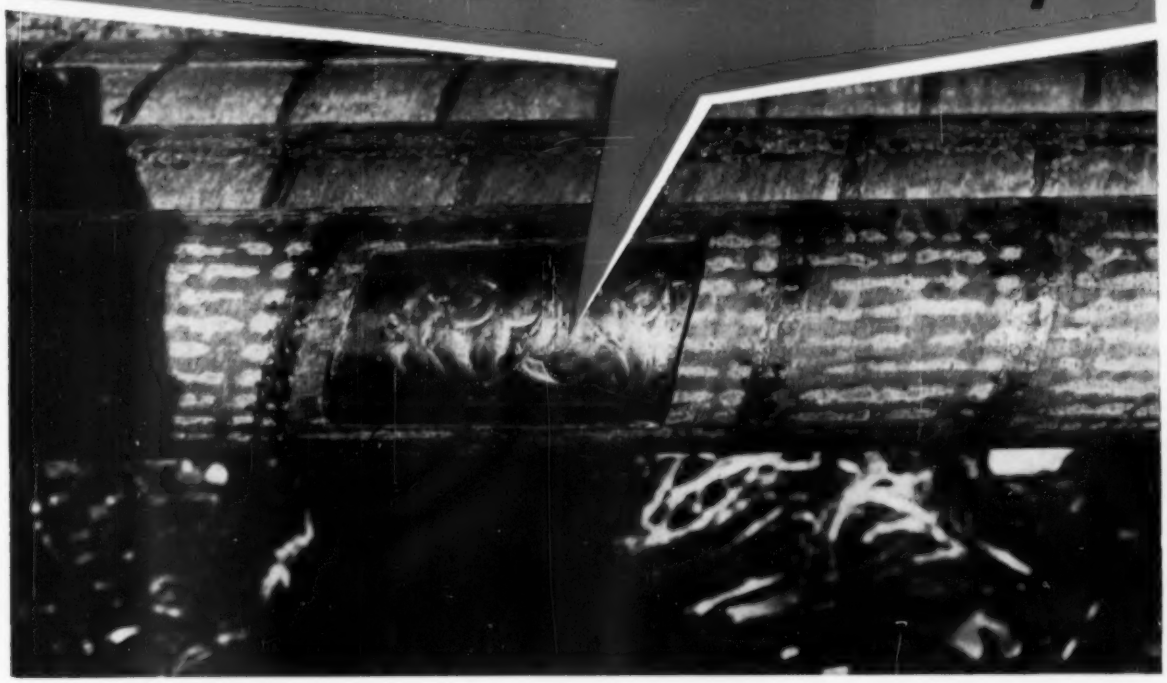
The compressor station phase of the project includes six new stations with a total of 53,700 hp in Mississippi, Tennessee, New York and Pennsylvania, and 63,540 hp in expansion of seven existing stations in Tennessee, Kentucky, Ohio and Pennsylvania.

Peoples Gas to get bigger gas supply

Texas Illinois Natural Gas Pipeline Co., Chicago, and Chicago District Pipeline Co., Joliet, Ill., have received FPC authorization to construct facilities that will enable their parent company, Peoples Gas Light & Coke Co., to increase its Chicago distribution system capacity by 50 per cent (Dockets G-10548 and G-10549).

Texas Illinois will spend $6,411,-

Will Your Pipeline Look This Good 20 Years from today?



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Why risk the chance of costly failures with "economy" coatings? Specify Pitt Chem *Coal Tar* Coatings and be *sure* of economical, long-lasting protection. For Pitt Chem Coal Tar Coatings are manufactured to rigid *published* specifications to give you assured protection with every drum. How can we help *you?* Send us the details of your coating problem.

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496
COST CUTTING CASE STUDY

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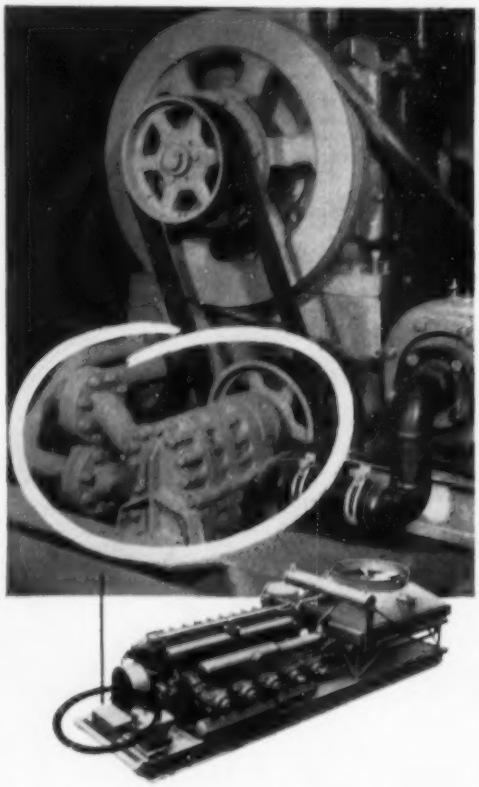
TAKE A TIP FROM CLARK



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These are the reasons Clark Bros., Inc. standardized on Berry Hydraulic Drives to run the direct mounted radiator fans on their portable, skidmounted HMA-B Compressors. They replace conventional belt drive and jack shaft. Clark finds that versatile Berry Drives give them greater latitude in locating the radiator fan. Their customers like the infinitely variable fan speed that can be changed to fit the cooling requirement. Since input horsepower is only that necessary to operate the fan under any given temperature condition, there is a saving in power during cooler weather. Proved too, are lower upkeep costs and longer component life resulting from the cushioning effect of fluid power.

What does this mean to You?

The advantages of Berry Hydraulic Drives can be translated into lower costs on *your* power transfer requirements. Economical and easy to install, Berry Hydraulic Pump/Motor Drives assure smooth, sure, foolproof power at infinitely variable speeds. They are quiet running with maximum power efficiency. And, you can depend on Berry Hydraulic Pump/Motor Drives!

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60-6

pipeline news • *Cont'd.*

000 to construct a 30-in. loop line from Joliet to connect with the existing 30-in. Chicago District's Howard St. line. This 38-mile section will parallel an existing 20-in. line.

Chicago District will build approximately 14.1 miles of 36-in. line from the eastern terminus of its Howard St. pipeline to the northerly city limits of Chicago, where it will make an additional connection with Peoples Gas Light & Coke Co. and Northern Illinois Gas Co. Cost of this construction is estimated at $4.6 million.

Electric utility buys gas from Richfield

Southern California Edison Co., Los Angeles, has reached an agreement with Richfield Oil Corp. to obtain supplies of natural gas to operate steam generating plants.

The contract will run for a 20-year period, and will cover the sale of $200 to $300 million worth of natural gas. Delivery is expected to begin in late 1958.

Edison officials say they already have ordered pipe to build a 200-mile line from the Richfield reserves in the San Joaquin valley to Los Angeles.

Richfield President Charles S. Jones said the price of the gas will be related to market conditions and the volume available will depend upon the company's conservation requirements.

The electric utility describes the move as part of Edison's efforts to cooperate with the Los Angeles County Air Pollution Control District. The district wants natural gas used in place of fuel oil wherever possible to cut down on emission of sulfur dioxide, a contributor to smog. The Edison steam plants have long been a target of anti-smog forces.

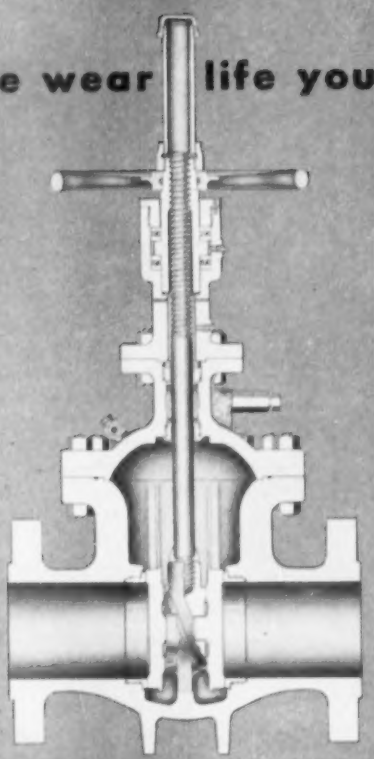
Northern gets okay for 354 miles of line

Northern Natural Gas Co.'s year-long effort to receive FPC authorization to expand its system to the Superior-Duluth area of Minnesota has received another piece-meal okay (Docket C-2399 et al).

The Omaha, Neb. based transmission company has been granted a certificate authorizing construction and operation of 354 miles of

New CRANE Double-Disc Valve

has the wear life you want on pipeline service



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Available in sizes 4 to 24 inches; flanged ends (No. 1680) or butt-welding ends (No. 1681). Either spur or bevel gearing can be provided. For full details, see your local Crane Representative or write to address below.

Developed for both oil and gas transmission, this new Crane gate valve has the long-wear features you want for steady, trouble-free service in your lines.

This new Crane valve design has free-to-rotate double discs—hung independently to change seating position with every operation. Each time this valve is opened or closed, both discs are free to turn to provide cleaning action on seating contact areas, and thus prevent abrasive materials from collecting.

Disc clearances are always accurate, because the two identical discs move up and down in machined body-guide ribs—which take the service abuse usually forced on disc faces in conventional double-disc gate valves, a frequent cause of damage and costly maintenance.

Consider and compare, too, the perfect disc alignment in this smooth-working Crane pipeline valve. Annular-shaped machined wedging surfaces keep both discs and the body ring seat faces lined up at all times—and, in addition, compensate for any slight body deflections caused by line strains.

CRANE VALVES & FITTINGS

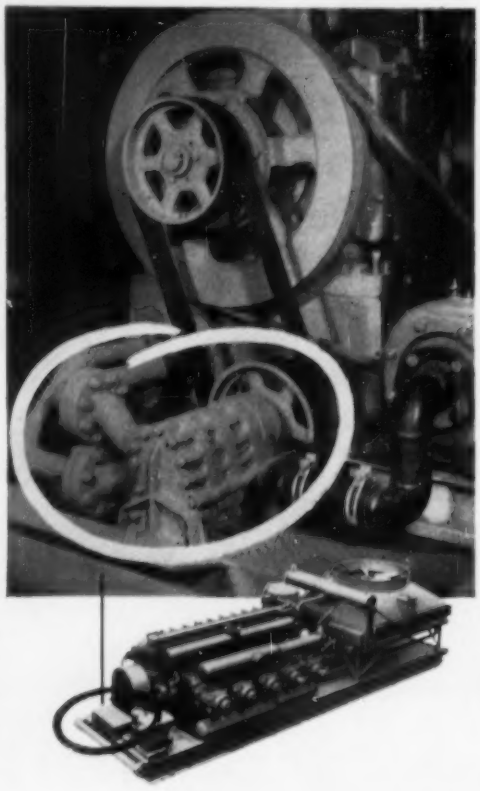
PIPE • KITCHENS • PLUMBING • HEATING

Since 1855—Crane Co., General Offices: Chicago 5, Ill.—Branches & Wholesalers Serving All Areas

496
COST CUTTING CASE STUDY

BERRY® Hydraulic Drives . . .
Standard on Clark Compressors

TAKE A TIP FROM CLARK



Berry drives give:

- COOL WEATHER ECONOMY
- PRECISION TEMPERATURE CONTROL
- INFINITELY VARIABLE FAN SPEED
- FLEXIBLE FAN LOCATION
- LOWER MAINTENANCE COST
- SIMPLIFIED POWER TRANSMISSION

These are the reasons Clark Bros., Inc. standardized on Berry Hydraulic Drives to run the direct mounted radiator fans on their portable, skidmounted HMA-B Compressors. They replace conventional belt drive and jack shaft. Clark finds that versatile Berry Drives give them greater latitude in locating the radiator fan. Their customers like the infinitely variable fan speed that can be changed to fit the cooling requirement. Since input horsepower is only that necessary to operate the fan under any given temperature condition, there is a saving in power during cooler weather. Proved too, are lower upkeep costs and longer component life resulting from the cushioning effect of fluid power.

What does this mean to You?

The advantages of Berry Hydraulic Drives can be translated into lower costs on *your* power transfer requirements. Economical and easy to install, Berry Hydraulic Pump/Motor Drives assure smooth, sure, foolproof power at infinitely variable speeds. They are quiet running with maximum power efficiency. And, you can depend on Berry Hydraulic Pump/Motor Drives!

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It's packed with simplified cutaways and data that tell you the "why" and "how" of Berry Hydraulic Drives.

BERRY DIVISION
OLIVER IRON AND STEEL CORPORATION
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BB-8

pipeline news • *Cont'd.*

000 to construct a 30-in. loop line from Joliet to connect with the existing 30-in. Chicago District's Howard St. line. This 38-mile section will parallel an existing 20-in. line.

Chicago District will build approximately 14.1 miles of 36-in. line from the eastern terminus of its Howard St. pipeline to the northerly city limits of Chicago, where it will make an additional connection with Peoples Gas Light & Coke Co. and Northern Illinois Gas Co. Cost of this construction is estimated at $4.6 million.

Electric utility buys gas from Richfield

Southern California Edison Co., Los Angeles, has reached an agreement with Richfield Oil Corp. to obtain supplies of natural gas to operate steam generating plants.

The contract will run for a 20-year period, and will cover the sale of $200 to $300 million worth of natural gas. Delivery is expected to begin in late 1958.

Edison officials say they already have ordered pipe to build a 200-mile line from the Richfield reserves in the San Joaquin valley to Los Angeles.

Richfield President Charles S. Jones said the price of the gas will be related to market conditions and the volume available will depend upon the company's conservation requirements.

The electric utility describes the move as part of Edison's efforts to cooperate with the Los Angeles County Air Pollution Control District. The district wants natural gas used in place of fuel oil wherever possible to cut down on emission of sulfur dioxide, a contributor to smog. The Edison steam plants have long been a target of anti-smog forces.

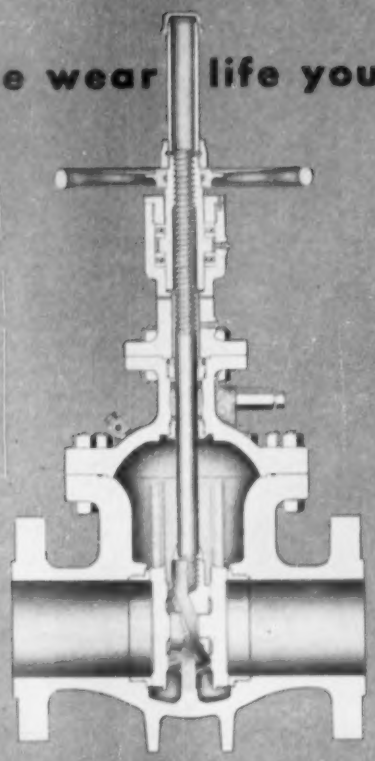
Northern gets okay for 354 miles of line

Northern Natural Gas Co.'s yearlong effort to receive FPC authorization to expand its system to the Superior-Duluth area of Minnesota has received another piece-meal okay (Docket C-2399 et al).

The Omaha, Neb. based transmission company has been granted a certificate authorizing construction and operation of 354 miles of

New CRANE Double-Disc Valve

has the wear life you want on pipeline service



ORDER NOW!

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CRANE VALVES & FITTINGS

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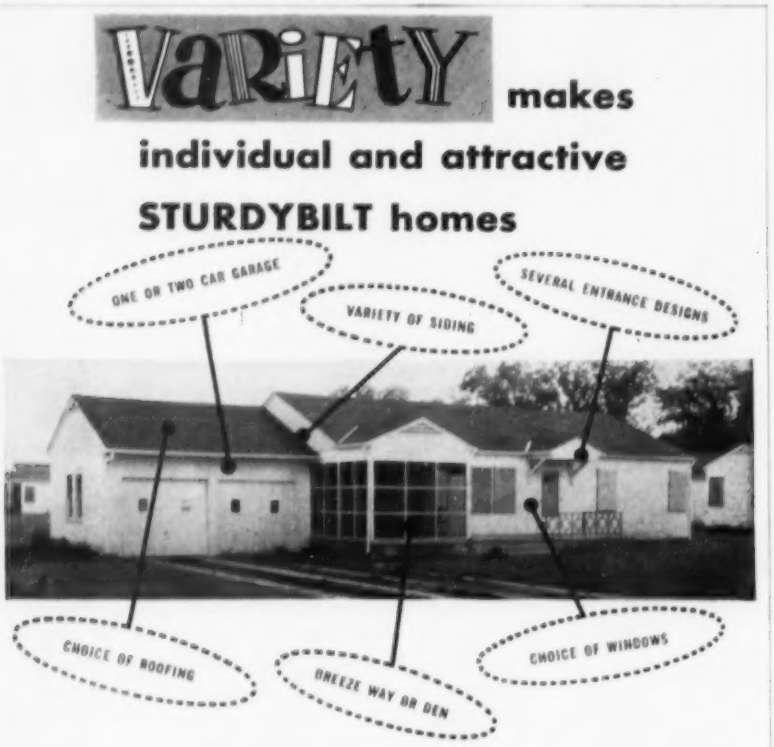
pipeline and 18,640 hp in compressor capacity. This will boost the company's sales capacity in the Midwest by 65 MMcf/day.

Included in the authorization is a 163-mile pipeline extension of Northern's system from Sioux Falls, S. D. to Aberdeen, S. D., plus 160 miles of branch lines to serve 20 new wholesale customers in South Dakota.

The certificate also authorizes Northern to supply additional gas to present customers and to provide new service to eight towns in Iowa; to supply additional gas to the Allied Chemical & Dye Corp.'s ammonia plant near Omaha, Neb., and to serve the St. Paul Ammonia Products Inc. plant at Rosemont, Minn.

The authorized facilities are part of a larger expansion program proposed by Northern, which also includes an extension of the company's system to the Duluth-Superior area. The latter part of the project is in competition with the proposed system of Midwestern Gas Transmission Co., Houston, whose application is pending before the FPC. Further hearings on this part of Northern's proposed project will be set by the FPC. The recent authorization was limited to non-competitive parts of the Northern proposal.

The FPC has deferred decision on requests by interveners seeking natural gas from Northern's system to serve 97 new communities.



Industrial housing developments need not be made of "look alike" houses. Even when floor plans are the same, exterior appearances can be changed so each STURDYBILT Prefabricated home may have an attractive, individual personality of its own.

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STURDYBILT PREFABRICATED, DEMOUNTABLE HOUSES

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STURDYBILT HOUSES COMPLY WITH COMMERCIAL STANDARD CS125 OF THE NATIONAL BUREAU OF STANDARDS FOR PREFABRICATED HOMES

More sales okayed for American Louisiana

American Louisiana Pipe Line Co. will sell 7.1 MMcf/day of natural gas to eight companies and cities in Indiana, Illinois, Iowa, Michigan and Wisconsin under provisions of an FPC order (Dockets G-2306 et al).

Two of the sales will be made directly from American Louisiana's system. The other six will be made by Michigan Wisconsin Pipe Line Co., an affiliate. The FPC also permanently allocated an additional 11 MMcf/day of American Louisiana gas to Michigan Consolidated Gas Co., Detroit, another affiliate.

This FPC action brings the amount of gas permanently allocated from American Louisiana's system to 238.1 MMcf/day. Previously the commission had permanently allocated 135 MMcf/day to Michigan Consolidated and 85 MMcf/day to Michigan Wisconsin.

As a result of this order, Michigan Consolidated now has a permanent allocation of 146 MMcf/day, and an additional temporary 52.6 MMcf. Michigan Wisconsin's permanent allocation is 90 MMcf/day plus a temporary supply of 9.3 MMcf.

Companies and cities which will receive gas under the FPC order are Lincoln Natural Gas Co., and Ohio Valley Gas Corp. (to be served by American Louisiana), and Aledo, Ill., Bloomfield, and Lamoni, Iowa; Michigan Gas and Electric Co., Illinois Power Co., and Natural Gas Distributors, Inc., all served by Michigan Wisconsin.

American Louisiana receives more gas

Texas Gas Transmission Corp. will transport 32.5 MMcf/day of natural gas to American Louisiana Pipe Line Co.'s system in Louisiana under authority granted by the FPC (Docket G-10395).

Construction of the delivery fa-

Hourly pressure information is transmitted from Northern Natural Gas Company compressor and field dispatch station to chief dispatcher's office in Omaha, Nebraska, by Bell System private line telephone.

How they protect 800,000 homes from a sudden temperature drop

There's a sudden drop of temperature in the Dakotas—and dispatchers of the Northern Natural Gas Company swing into action—to assure normal gas pressures for local distributing companies serving 800,000 domestic users through 10,000 miles of pipeline all the way from New Mexico to Minnesota!

Dispatchers, using Bell System private line telephone facilities, ask certain large industrial users to switch temporarily to other fuels.

Then, through contact with 35 compressor stations by telephone, dispatchers at Omaha headquarters direct the additional gas thus gained to the desired localities. A potential emergency is handled in stride, thanks to modern communications.

. . .

The Bell System welcomes the opportunity to help you obtain the most reliable and economical communications facilities. Call your Bell System representative.

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calities will cost $783,100. The gas will come from four fields.

Texas Gas will establish two delivery points into the American Louisiana system. One, near Lowry, La., will require about 0.85 miles of line, and will be used temporarily pending completion of other construction. When the other facilities are completed, the Lowry connection will be used only for emergencies.

The second delivery connection, about a mile in length, will interconnect major lines on each system near Eunice or North Tepetate, La., and will be the prime delivery point. In addition, Texas Gas will build about 11.8 miles of line near Eunice, install one 540-hp compressor unit at an existing station, and construct seven measuring stations.

Huber loses fight to drop customer

J. M. Huber Co. has lost its court battle to drop Northern Natural Gas Co. from its gas customers.

A federal district court of appeals in Philadelphia has upheld an FPC order forbidding the Huber Corp. from discontinuing its supply of gas to Northern. Huber supplies the transmission company with gas from 11 wells in Carson county, Texas. The company said it would stop selling gas to Northern, an interstate carrier, following an order from the FPC that it must obtain a certificate of convenience in order to sell gas to that company.

Huber claimed it was only a producer, and did not come under FPC jurisdiction. The court's decision affirms that Huber falls under FPC jurisdiction because it sells to an interstate carrier, and therefore cannot discontinue service without commission permission.

Panhandle seeks to drop customer

Panhandle Eastern Pipe Line Co., Kansas City, Mo., has asked the FPC for permission to drop Michigan Consolidated Gas Co. from its list of customers (Dockets G-10396 et al).

Panhandle charged the utility, which supplies the Detroit area, with "persistent interference" with its business.

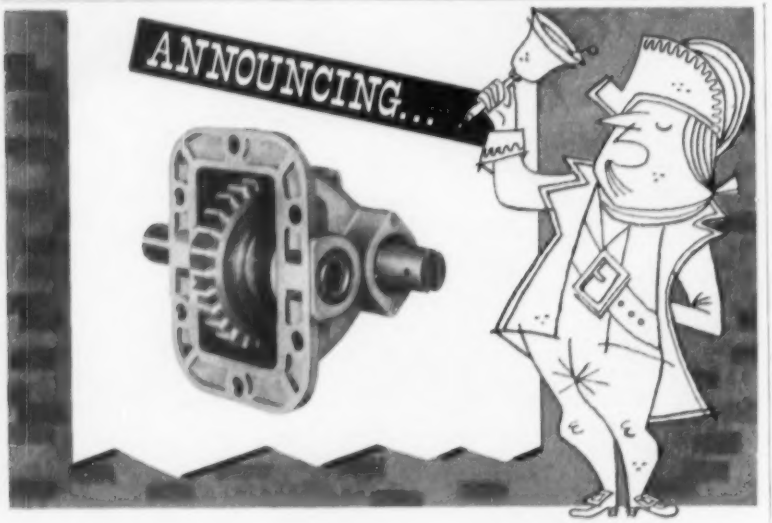
The transmission company says it wants to use the 127 MMcf/day now sold to Michigan Consolidated to increase its deliveries to customers in Indiana, Ohio, Illinois, Missouri, and Michigan. Panhandle maintains that Michigan Consolidated has engaged in "a long series of maneuvers designed to give Michigan Consolidated a monopolistic position in the area."

In its application to the FPC, Panhandle Eastern claims that the distribution company has a more than adequate supply of gas from two affiliated suppliers, Michigan Wisconsin Pipe Line Co. and American Louisiana Pipe Line Co. All three are subsidiaries of American Natural Gas Co.

Coal, rail forces fight Transco plan

Coal and railroad interests are banding together to wage a bitter protest against Transcontinental Gas Pipe Line Corp.'s proposal to pipe natural gas into the tideland areas of the Carolinas.

Transco proposes to boost natural gas supplies in the Carolinas by



NEW SINGLE SPEED . . . ALUMINUM HOUSING . . . POWER TAKE-OFF

IT'S A TULSA® . . . ALWAYS BEST!

Important features that make this new TULSA power take-off outstanding:

- Die-cast aluminum housing . . . extremely lightweight
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- Three output shaft sizes
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This new power take-off for all medium duty work offers all the advantages of the complete TULSA line—highest quality, nationwide distribution and service.

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TULSA, OKLAHOMA DIVISION OF VICKERS Inc.

CREWS LIKE TO WORK WITH Youngstown ELECTRIC WELD LINE PIPE BECAUSE IT GIVES THEM ALL THE BENEFITS OF THE "BIG 5"

Here are the "Big 5" reasons why Youngstown Electric Weld Line Pipe is your best buy:

1. It bends readily
2. Wall thickness is uniform
3. Line up characteristics are excellent
4. Weldability is outstanding
5. Long lengths save you time and trouble

Crews, contractors and oil and gas companies all like the time- and labor-saving "Big 5" benefits of Youngstown Electric Weld Line Pipe.

Youngstown Electric Weld Line Pipe saves time and trouble because it's made in long lengths. These long lengths, of course, result in minimum handling and welding—that speeds up installation and reduces pipe line costs.

Wherever there is oil and gas to be transported, there is Youngstown to serve you.

Youngstown

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QUALITY YOUNGSTOWN SERVICE

THE YOUNGSTOWN SHEET AND TUBE COMPANY *Manufacturers of Carbon, Alloy and Yoloy Steel*

General Offices: - - - Youngstown 1, Ohio.

pipeline news • *Cont'd.*

60 MMcf/day. This gas would be distributed by three companies, North Carolina Natural Gas Co., Wadesboro, N. C.; Carolina Pipeline Co., Greenville, S. C., and Transcarolina Pipeline Corp., Raleigh, N. C., to about 40 communities.

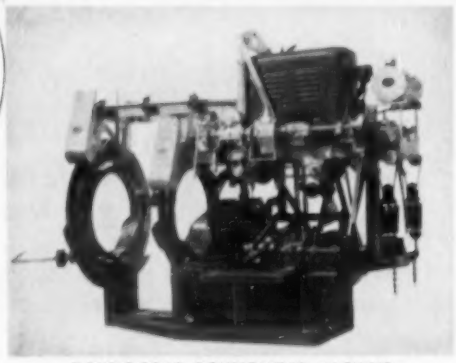
The bituminous coal forces, perennial opponents of gas industry expansion programs, has told the FPC that 335 miners would be left jobless if the expansion program is approved and completed. The group also claims that the industry will lose more than $10 million in revenue in the next three years if the program is approved.

The Atlantic Coast Line railroad also is fighting the Transco plan. The railroad told the FPC that piping in the natural gas will result in an increase of freight rates and less rail service in the areas served by the pipeline. Atlantic Coast Line says its biggest share of business now comes from hauling coal, and that any curtailment of that business would drastically cut down other rail service.

A SPRAY SHOE Should SPRAY!

Perrault Coating & Wrapping Machines Have Exclusive NOZZLE-FITTED SPRAY SHOE

Spray shoe cross section shows how spray nozzles give DOUBLE dope coverage on pipe top, TRIPLE coverage on pipe bottom . . . Insurance for a better coating job.



DOUBLE-COAT, DOUBLE-WRAP MACHINE

PERRAULT COATING AND WRAPPING MACHINES for large pipe sizes are more dependable. They have less downtime because, when compared to the industry, they are designed with: More power, heavier transmissions, bigger clutches, stronger speed reducers, greater pumping capacity, full-width rubber crawlers. Even with these better components Perrault units are lighter in weight. Other models available for all pipe sizes; any coat and wrap combination. Call Perrault for complete details.

ALSO CARRIED IN STOCK:
Pneumatic Inside Line-up Clamps — sizes 20 to 36 in. Cleaning and Priming Machines — line traveling or stationary. Glass Pipe Wrap, Asbestos Felt Wrap, Kraft Wrap, and Rock Shield. Tar-Heating Kettles, Burners, Patch Pots and Accessories.
Pneumatic-Tired Lowering-In Cradles, Adjustable Pipe Cradles, Five-roller Cradles, Tongs, Hooks, Blocks, Belts, Slings, Line-up Clamps, Hand Tools, Supplies and Equipment of every sort.

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GAS pipeline people

O. S. Carpenter

G. T. Naff

Texas Eastern

Texas Eastern Transmission Corp., Houston, has made two top management appointments. GEORGE T. NAFF, president, was elected vice chairman of the board and ORVILLE S. CARPENTER, vice president and comptroller, was named president and a member of the board of directors. The new post of vice chairman has been created to strengthen the top management organization of the company and place greater emphasis on the long range plans of TET.

Northern Natural Gas Co., Omaha, has named JOSEPH A. SALERNO to the newly created post of field representative at Wichita, Kan., for the gas purchase section. He will be assigned to activities in Kansas, Oklahoma, and Colorado.

JACK E. PETERS has been appointed mobile sales engineer by the Bendix Radio division of Bendix Aviation Corp. In his new position, Mr. Peters will be responsible for sales and customer relations in connection with Bendix two-way radio communication systems in Ohio and western Pennsylvania. TANNEY E. OBERG is a new mobile sales engineer for Bendix in the state of New York. He will headquarter in Syracuse.

AUTREY Z. PARTAIN has been appointed a sales-service representative for the Protective Coatings division of Pittsburgh Coke & Chemical Co., Pittsburgh. He will work out of Tulsa.

Two men have been advanced to key positions in the compressor sales division of the J. B. Beaird Co., Shreveport. JOHN W. HENDRYX is now product sales manager for packaged compressors and J. E. KELLY is chief service and office

NATURAL GAS PIPELINE COMPANY OF AMERICA'S QUINDUNO STATION—equipped with five Beaird-Ingersoll-Rand 12SVG 660 h.p. packaged compressors. Young radiators with lubricating oil coolers, gas interstage and after coolers and all necessary controls. Other sizes 110 to 660 h.p.

Packaged Compressors Handle —

CRITICAL SOUR GAS PRODUCTION PROBLEM

3300 packaged compressor horsepower is used in the Natural Gas Pipeline Company of America's Quinduno Field station to boost sour casinghead gas through a desulphurization plant and into transmission lines. Providing this horsepower are five Beaird-Ingersoll-Rand 12SVG 660-h.p. units. Gas engineered for the job, the units are equipped with stainless steel compressor piston rods and special rings. Engine radiators which contain gas interstage and aftercooling sections, have been constructed with admiralty metal tubes and aluminum fins. All compressor fittings and scrubber elements have been built from non-corrosive materials.

Capable of handling up to 25 mmcfd, the units pick up at 19 psig and use two stages to boost the gas to transmission line pressure of 260 psig.

Packaged compressors were selected by Natural Gas Pipeline because of the savings that could be achieved in installation time and labor. Also should the gas volume drop off, one or more plants could be moved as complete units to other service. The remaining units would then economically continue production throughout the life of the field. Each of the units when finally taken out of this service, and moved to another, will be almost wholly salvaged.

Let us show you how a Beaird-Ingersoll-Rand packaged compressor plant can be designed to meet your special operating requirements.

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PACKAGED COMPRESSOR PLANTS

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PRESSURE BULK STORAGE

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LP-GAS SYSTEMS

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pipeline people • *Cont'd.*

engineer. Mr. Hendryx was formerly a sales engineer and Mr. Kelly a service engineer.

H. D. HENDERSON has joined Trunkline Gas Co., Houston, as manager of production and supply. For the past 10 years Mr. Henderson has been associated with Sohio Petroleum Co. In his new position, he will supervise the company's gas supply, gas reserves, and geological departments and will direct the organization of a production department.

H. D. Henderson
Trunkline

George Meason
Tennessee Gas

Jack Head
Texas Eastern

L. P. Brown, Jr.
Royston

GEORGE H. MEASON, formerly with the technical and research department of the Humble Oil & Refining Co., has joined Tennessee Gas Transmission Co., Houston, as chief process engineer. Mr. Meason will develop a technical organization within the company's plants and processing departments.

JACK D. HEAD has been appointed assistant general counsel for Texas Eastern Transmission Corp., Shreveport. Under the direction of Charles I. Francis, vice president and general counsel, Mr. Head will supervise the activities of the legal department of the company and participate along with other counsel in matters before the FPC and the courts.

Royston Laboratories Inc., Pittsburgh, has appointed LINN P. BROWN JR. as regional manager covering the New England and Middle Atlantic area. He will headquarter in Philadelphia.

J. R. MATULLO has been appointed branch manager of the Worthington Corp.'s New Jersey Sales office.

M. JERRY JONES has been appointed district sales representative for General Electric communication equipment. He will headquarter in Redwood City, Calif.

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WmSON-HILLCO MODEL 100
TAPPING MACHINE

SHORTER LENGTH permits
Taps in limited spaces

COMPACT, RUGGED DESIGN
Insures longer life

HIGH PRESSURE—HIGH TEMPERATURE
(1,440 psi @ 100°F or 700 psi @ 700°F)

TAP SIZES: 2" & Smaller

MODEL
100-B

For the Plant and Field . . .
Three other sizes of
WmSON-HILLCO Tapping Machines

MODEL 360
Taps to 6"—Hand operated

MODEL 660
Taps to 16"—Power operated

MODEL 1200
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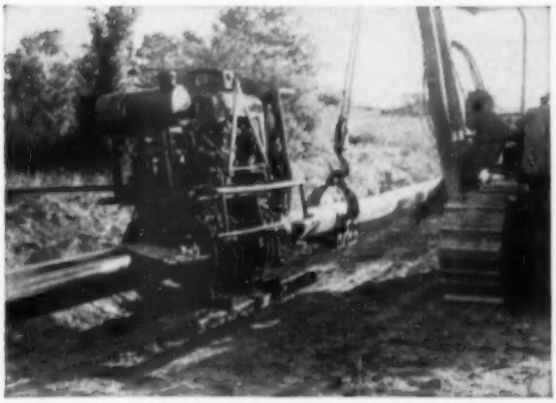
GAS progress reports

NEW CONSTRUCTION PLANNED

TENNESSEE GAS TRANSMISSION CO., Houston. To build 1085 miles of line, six new compressor stations, and enlargements of seven existing stations. Would consist of 557-mile, 30-in. line from Mississippi river delta south of New Orleans, running northeast through Louisiana, Mississippi, Alabama, and Tennessee; 120 miles of 26-, 20-, and 12-in. from Kinder, La. station south to shoreline and into Gulf (some 68 miles of line would be under water); 276 miles of 30- and 26-in. in Kentucky; 39 miles of 26-in. in West Virginia; and 22 miles of

Pipeline laid over rugged terrain.

Pipeline ditch cuts through shale and rock.



Cleaning machine and primer application.

NO-OX-ID and wrapper applied by Traveliner.

NO-OX-ID COMBINATIONS FOR LONG-TERM PIPELINE PROTECTION

Before you specify the protection you want on your next pipeline job, check into the advantages of Dearborn's NO-OX-ID Coating Combinations. They're your assurance of dependable, long-term protection. Your Dearborn Pipeline Engineer, a specialist in corrosion control, will consult with you and recommend the combination best suited to your requirements.

Investigate Dearborn's New Pipeline Enamel 240

The NEW Dearborn Pipeline Enamel 240 fills the need for a truly economical, long-lasting pipe coating. Made from selected asphaltic crudes, 240 is unusually flexible over a wide temperature range. It features all desirable characteristics with respect to ease of application, dielectric strength, flexibility, penetration, electrical resistance, and minimum moisture absorption. In actual tests, sample strips of 240 have been bent double at 50° F. over a one-inch mandrel without fracture.

ADVANTAGES OF NO-OX-ID PROTECTIVE COATINGS

- ★ Applied hot or cold
- ★ By hand, by Traveliner or at the mill
- ★ No noxious fumes
- ★ Requires less equipment
- ★ Lasts longer

it pays to specify

Dearborn NO-OX-ID®

For Long-Term Pipeline Protection

WRITE FOR BULLETIN

"Protecting Underground Pipe from Corrosion with NO-OX-ID and NO-OX-IDized Wrappers" tells the story. Your copy is ready upon request.

DEARBORN CHEMICAL COMPANY • Merchandise Mart Plaza • Chicago 54, Ill.

WHAT WILL YOUR PIPE LINES LOOK LIKE 10 YEARS FROM NOW ?

In case after case, lines protected with TAPECOAT have been dug up after more than 10 years of service *with no signs of deterioration on the pipe surfaces uncovered.* That's why TAPECOAT coal tar coating is specified by those who realize that continuing protection is the *first* consideration.

Since 1941, this quality coal tar coating in handy tape form has demonstrated its ability to withstand corrosion year after year, above and below ground, on pipe, pipe joints, couplings and other vulnerable surfaces.

Why gamble with "unknown" protection? By using TAPECOAT, you'll be sure to have the quality protection you need for long service life without costly maintenance and replacement.

Write for brochure and prices

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Originators of Coal Tar Coating in Tape Form

1535 Lyons Street
Evanston, Illinois

progress reports • *Cont'd.*

26- and 24-in. in Pennsylvania. A 76-mile 24-in. line would start at Coudersport, Pa. station and run northwest through Colden storage field to near Buffalo, N. Y. New compressor stations would be in Mississippi, Tennessee, New York, and Pennsylvania (53,700 hp total); 63,540-hp enlargements would be in Tennessee, Kentucky, Ohio, and Pennsylvania.

CURRENT CONSTRUCTION

ALBERTA GAS TRUNK LINE CO. LTD., to build 130-mile gathering line near Edmonton-Bonnie Glen line south to Calgary; 80-mile line to Bassano, and 130-mile line to Saskatchewan boundary to gather and move gas to meet Alberta's requirements and export needs of Trans-Canada Pipe Lines Ltd. 1956 construction includes 16 miles of 18-in. pipe and 18 miles of 34-in. to connect the Bindloss field with western terminus of Trans-Canada's lines.

ARKANSAS LOUISIANA GAS CO., Shreveport. Docket G-2307 for 134 miles of 6⅝- to 24-in. line in 11 sections, and 10,500-hp compressor station on its system in Arkansas, Louisiana and Texas. Compressor station and 71 miles of line completed.

COLORADO INTERSTATE GAS CO., Colorado Springs. Docket G-2121-(1956 program) 239 miles of 22-in. line from Laramie, Wyo. to connection with Pacific Northwest Pipeline Corp. line at Green River, Wyo. R. H. Fulton will start two spreads April 15. Nov. 1 completion schedule delayed due to late pipe delivery.

MICHIGAN WISCONSIN PIPE LINE CO., Detroit. Docket G-2327 for approximately 251.9 miles of 24-, 18-, 12-, 6-, and 4-in. loops and 3400 hp additional at existing compressor stations in Illinois. Gabe Construction Co. at work on 46.8 miles of 4- and 6-in. loops in Iowa and Missouri; Houston Contracting Co. and H. C. Price at work on 141.7 miles of various sizes in Illinois and Wisconsin; 63.4 miles of 4- and 6-in. loops remain to be contracted for.

PACIFIC GAS & ELECTRIC CO., San Francisco. Midwestern-Johnson-Dixon at work on 85-mile, 34-in. line paralleling Super Inch from Topock, Ariz. to Milpitas, Calif. Other contractors at work on 6620-hp additions at Topock and Kettleman compressor stations.

PERMIAN BASIN PIPELINE CO., Omaha. Dockets G-9688 and 9724. For 19-mile, 16-in. line and 6750-hp compressor station in Andrews county, Texas, to take gas from Phillips gasoline plant. Gasoline Plant Construction Corp. Houston building compressor station; R. H. Fulton the line.

SOUTHERN CALIFORNIA and SOUTHERN COUNTIES GAS CO., Los Angeles. To build 236-mile, 30-in. line from Newhall, Calif. to Topock, Ariz. on Colorado river to meet El Paso Natural line from San Juan and Permian basins. Also three 1760-hp compressors at Topock. R. H. Fulton & Co., Lubbock, Texas, has contract for line. Initial work to begin this month. Scheduled for completion in June, 1957.

TEXAS GAS TRANSMISSION CORP., Owensboro, Ky. Docket G-8828 for 189 miles of line and 19,190 hp in compressor capacity along its system in Louisiana, Arkansas, Mississippi, Tennessee, Kentucky, and Indiana. Contracts for 10,820 compressor hp let to Longview Equipment Co. and 7500 hp to Ford, Bacon & Davis. Compressor construction begun. Work completed on 9.2 miles of pipe, contracts let on remainder to Houston Contracting Co., Williams Brothers Co., and Union Construction Co.

TRANS-CANADA PIPE LINES LTD., for 2250-mile gas line taking Alberta gas from Alberta-Saskatchewan border to Toronto and Montreal, with lateral from Winnipeg to Emerson, Man., 34-in. line from Alberta border to Winnipeg under construction, 30-in. from Winnipeg to Toronto; 24- and 20-in. from Toronto to Montreal; 24-in. from Winnipeg to Emerson; 10 compressor stations totaling 105,000 hp. First four sections of line under contract to Majestic Contractors Ltd., Mannix Ltd., Canadian Bechtel Ltd., and Dutton-Williams Brothers. As of July 31, 131 miles of ROW cleared and graded and 56 miles of pipe strung.

WESTCOAST TRANSMISSION CO. LTD., Calgary. To build 650-mile, 30-in. line from Peace river area to near Vancouver, B.C., to connect with line of Pacific Northwest Pipeline Corp., to transport 370 MMcf daily of which 300 MMcf is to be delivered to PNW. Work has commenced on all four sections between Peace river and International Border. Scheduled for completion in fall of 1957.

APPROVED

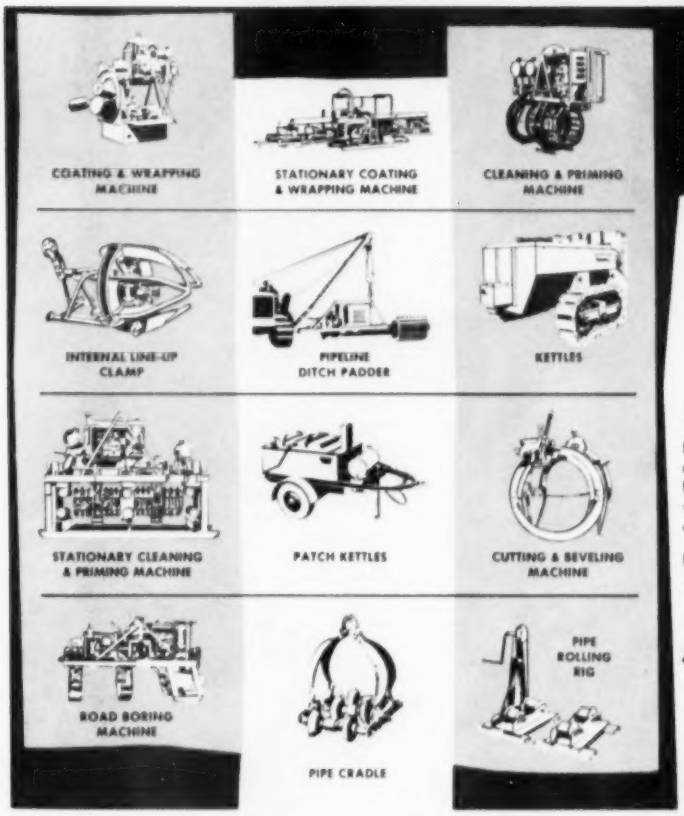
CHICAGO DISTRICT PIPELINE CO., Joliet, Ill. Docket G-10549 for 14.1 miles of 36-in. line from terminus of existing Howard Street line in Elk Grove, Ill., to a point on northerly city limits of Chicago.

GULF INTERSTATE GAS CO., Houston. Docket G-10841 for 2000-hp addition to Acadia, La. station; 3500-hp addition to Stanton, Ky. station; new 3500-hp stations at Rapides, La.; Humphrey and Alcorn, Miss.; and Macon, Tenn.; and miscellaneous small gathering lines and measuring stations.

NORTHERN NATURAL GAS CO., Omaha. Docket G-2485 for 9-mile, 30-in. line north of Clifton, Kan., and one 2000-hp addition at Sunray, Texas, to serve Allied Chemical & Dye Corp.

TEXAS ILLINOIS NATURAL GAS PIPELINE CO., Chicago. Docket G-10548 to build 36-in. loop between Joliet and Volo, Ill. to enable increased deliveries to Chicago District Pipeline Co.

NORTHERN NATURAL GAS CO., Omaha. Dockets G-2399, et al, for 654 miles of line and an additional 12,640 hp in compressor capacity. Also 15-mile 24-in. line from Ogden, Iowa to underground storage near Redfield; 168-mile 20-in. from Twin City area to Duluth and Superior; 92-mile 12-in. and 71-mile 10-in. line in South Dakota and 307 mile of branch lines. Compressor additions and 15-mile line to test Redfield storage project approved. Contracts for compressors and line let to H. B. Zachary, Dresser Engineering Co., Foor Engineering Co., R. H. Fulton & Co., and Pentzien Inc. Newly approved portion includes a total of 354 miles of line and 18,640 hp in compressor capacity broken down as follows: 163-miles extension from Sioux Falls, S. D. area to Aberdeen, S. D. plus 160 miles of branch lines in South Dakota. Not approved is the Duluth-Superior extension.



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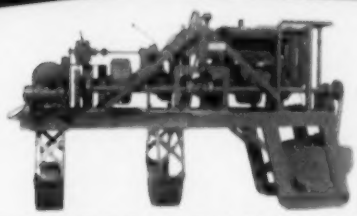

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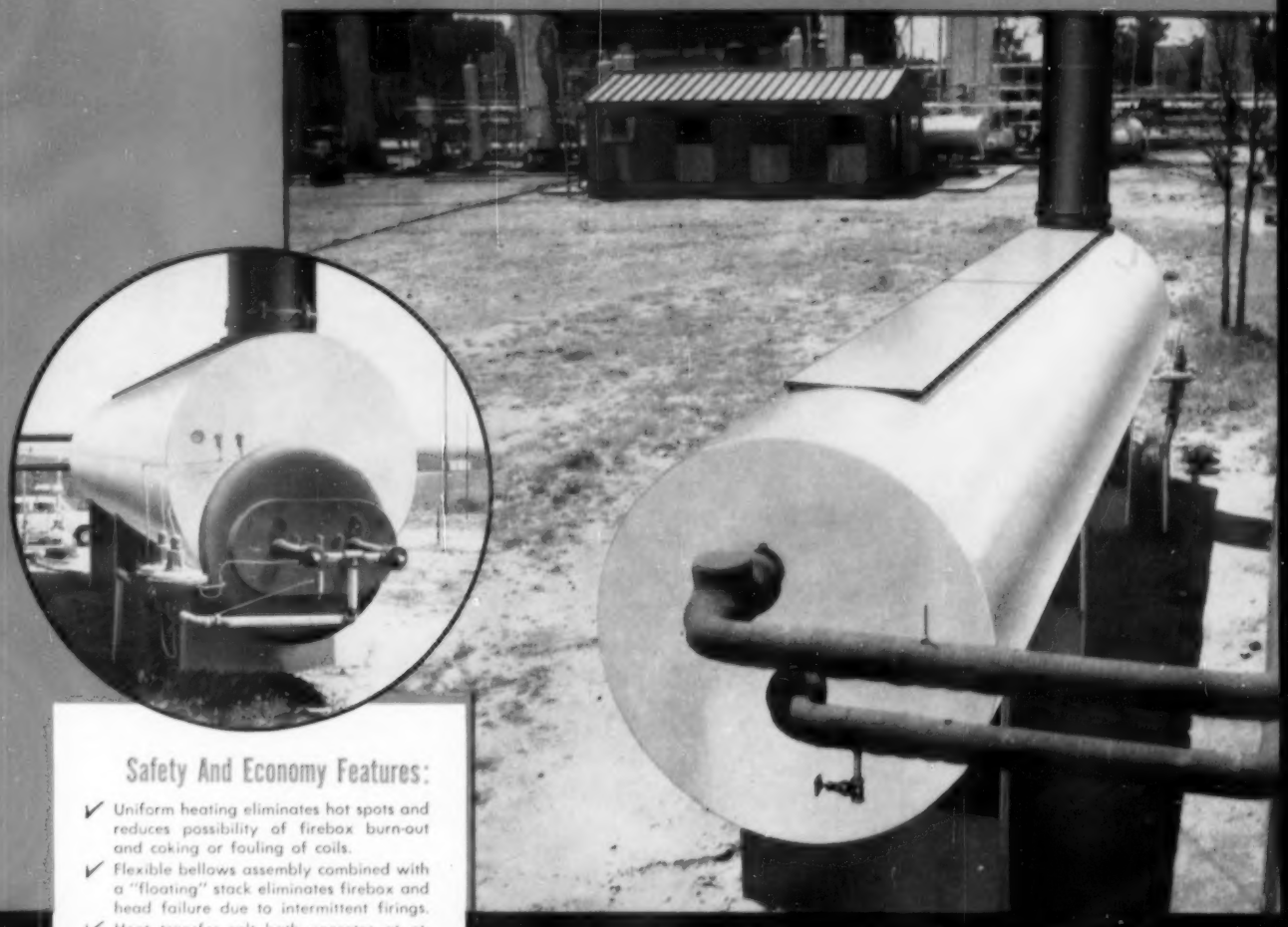

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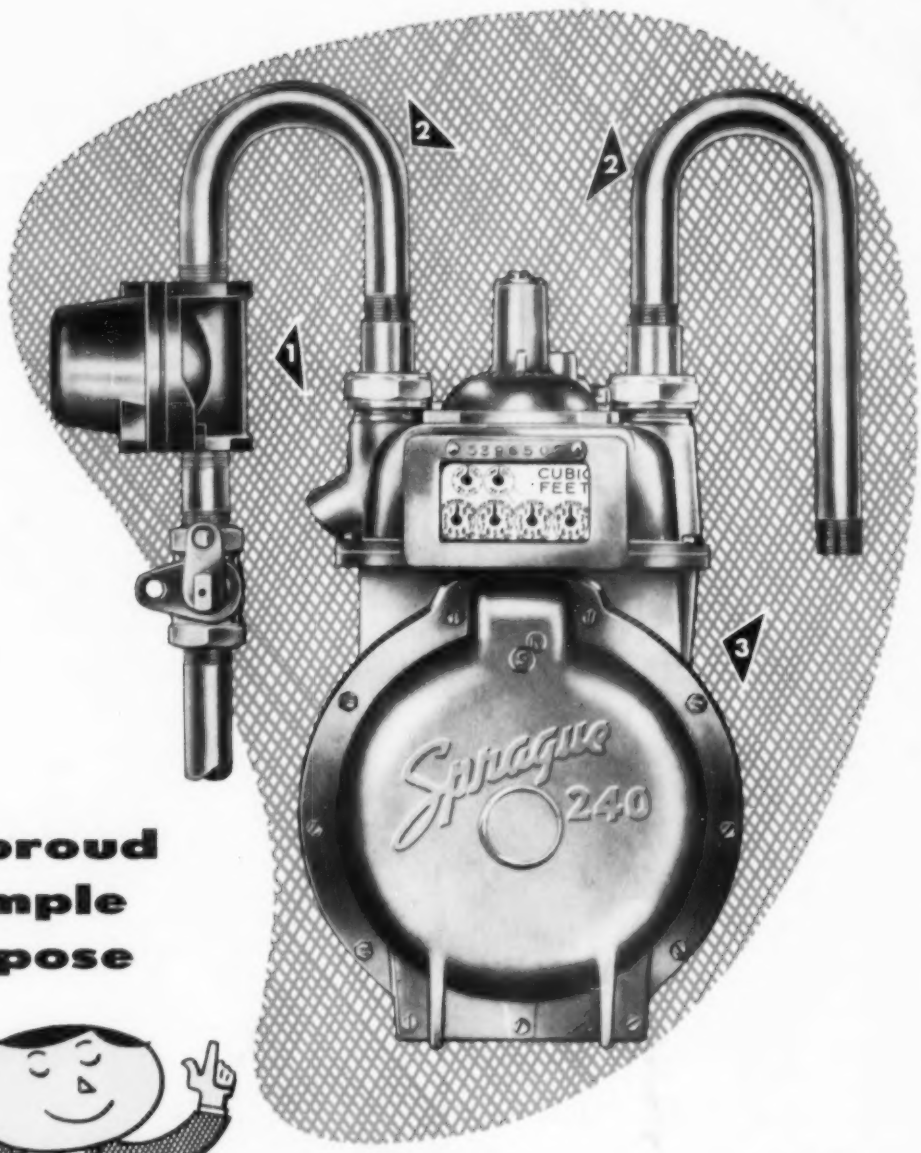

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